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NEW GENERA AND SPECIES OF NOCTUIDAE FROM VIETNAM, THAILAND AND NEPAL (LEPIDOPTERA)

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A taxonomic study of the Himalayan winter Noctuidae fauna has resulted a large number of new taxa. In this paper two new genera (*Daseutype* and *Csorbatype*), 39 new species (*Hermomassa sobeyi*, *Diarsia ypsiloidea*, *Dryobotodes himalayensis*, *Himalistra jeleni*, *Nyctycia dissimilis*, *N. szabokyi*, *N. nivescens*, *N. ionochlora*, *N. albivariiegata*, *N. niveifera*, *Potnyctycia frontieri*, *Meganycitycia fansipana*, *Isolasia caovansungi*, *I. jacktordoffi*, *I. dilutissima*, *Daseuplexia brevipennata*, *Daseutype porphyrea*, *Paranyctycia miraculosa*, *Agrochola kosagezai*, *A. pallidilinea*, *A. karma*, *A. plumbitincta*, *Hemiglaea ionea*, *Rhynchaglaea discoidea*, *Owadaglaea reticulata*, *Elwesia macrophthalma*, *E. vuquangconi*, *Hyalobole subtropica*, *Xanthia glaucozona*, *Mniotype chlorobesa*, *M. csanadii*, *Apamea erythrographa*, *A. nigrostris*, *Chandata maminti*, *Actinotia stevenswani*, *Diphtherocome impectinata*, *D. bryochlora*, *D. chloronympha*, *Amphipyra owadai*) and 7 new subspecies (*Nyctycia stenoptera violascens*, *N. endoi hiemalis*, *Agrochola albirena annamica*, *Hemiglaea costalis leptotaenia*, *Elwesia tarka sericea*, *E. diplostigma vasarhelyii* and *Amphipyra owadai nepalensis*) are described. *Nyctycia plumbeomarginata* (HAMPSON, 1895), *Agrochola antiqua* (HACKER, 1992), *A. semirena* (DRAUDT, 1950), *A. sakabei* (SUGI, 1980) and *Diphtherocome thaumasia* (HREBLAY et RONKAY, 1998), are stated as comb. n. The majority of these novelties is collected in North Vietnam at the higher forest belts of the Fan Si Pan Mts (the highest mountains in Indochina). With 171 figures.

Key words: new taxa, Noctuidae, Himalayan winter fauna, Vietnam, Thailand, Nepal

INTRODUCTION

Within the framework of an academic exchange programme between the Hungarian Academy of Sciences and the Vietnamese National Centre for Natural Sciences started some thirty years ago. Entomologists of the Department of Zoology of the Hungarian Natural History Museum, Budapest carried out two shorter collecting trips to northern Vietnam in December 1997 and in March 1998 (PEREGOVITS *et al.* 1999). The present work fits well into the series of studies carried out by Hungarian lepidopterists during the last decade on the Noctuidae fauna of the greater Himalayan region from Pakistan to Taiwan. The aims of these studies were to explore the components of the so-called winter noctuid fauna and their zoogeographical connections within this region. However, due to

the unexplored nature of this fauna, surprisingly large number of new taxa had to be described in several former articles (e.g. HREBLAY & RONKAY 1997, 1998). These studies revealed the fact that a considerable part of the common Himalayan faunal elements in this huge region belongs to this faunal type.

In spite of the long-lasting cooperation with our Vietnamese counterpart, the study of the winter Noctuidae fauna, especially of the forest regions of the higher altitudes, was hereto much neglected in Vietnam. As the major result of the last two expeditions (PEREGOVITS *et al.* 1999) a representative material of the winter fauna was collected, containing an astonishingly large number of taxa being new for science.

During the final, proof-reading phase of the present paper several new data were added from the expedition led to northern Thailand by M. HREBLAY. Though the specimens of the newly described taxa collected by this expedition were incorporated into the type series, further extensive descriptions and illustrations were not prepared even if the other sex was not previously known. The descriptions of these novelties will be given in the forthcoming papers dealing with the Noctuidae fauna of the Indo-Chinese region.

Abbreviations: BMNH – The Natural History Museum, London; HM – HREBLAY MÁRTON; HNHM – Hungarian Natural History Museum, Budapest; MAK – Alexander Koenig Museum, Bonn; NSMT – National Science Museum, Tokyo; RL – RONKAY LÁSZLÓ.

DESCRIPTIONS OF THE NEW TAXA

***Hermonassa sobeyi* sp. n.**

(Figs 1–2, 107)

Holotype: male, “VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 29.XI.1997, leg. L. Peregovits & L. Ronkay”, slide No. RL6260 (coll. HNHM, Budapest).

Paratypes. Vietnam. 4 males, 3 females, with the same data as the holotype; 12 males, 2 females, from the same locality but dated 4–6.XII.1997 (coll. HNHM, Budapest, BMNH, London and G. RONKAY); 3 males, 4 females, Prov. Lao Cai, Sa Pa, Deo O Quay Ho, 1750 m, 14–17.V.1995, leg. M. OWADA (coll. NSMT, Tokyo). Thailand. Prov. Chiang Mai: 63 specimens, Mt. Doi Inthanon, NP, 2300 m, 11. & 19–20.XI.1998, leg. T. CSÖVÁRI & L. MIKUS; 68 specimens, from the same locality, 2. & 9.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS; 7 specimens, Mt. Doi Phahompok, 18 km NW of Fang, 2100 m, 7.XII.1998; 11 specimens, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 8.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. CSÖVÁRI, HREBLAY, Érd).

Slide Nos HM10489, HM11249, HM11261, NSMT2438, NSMT2440, NSMT2441, RL6077, RL6251, RL6252 (males), HM10490, NSMT2442, RL6199 (females).

Diagnosis: the new species belongs to the *H. consignata* WALKER, 1865 species-group, closely related to *H. consignata*, *H. siamensis* OWADA, 1985, *H.*

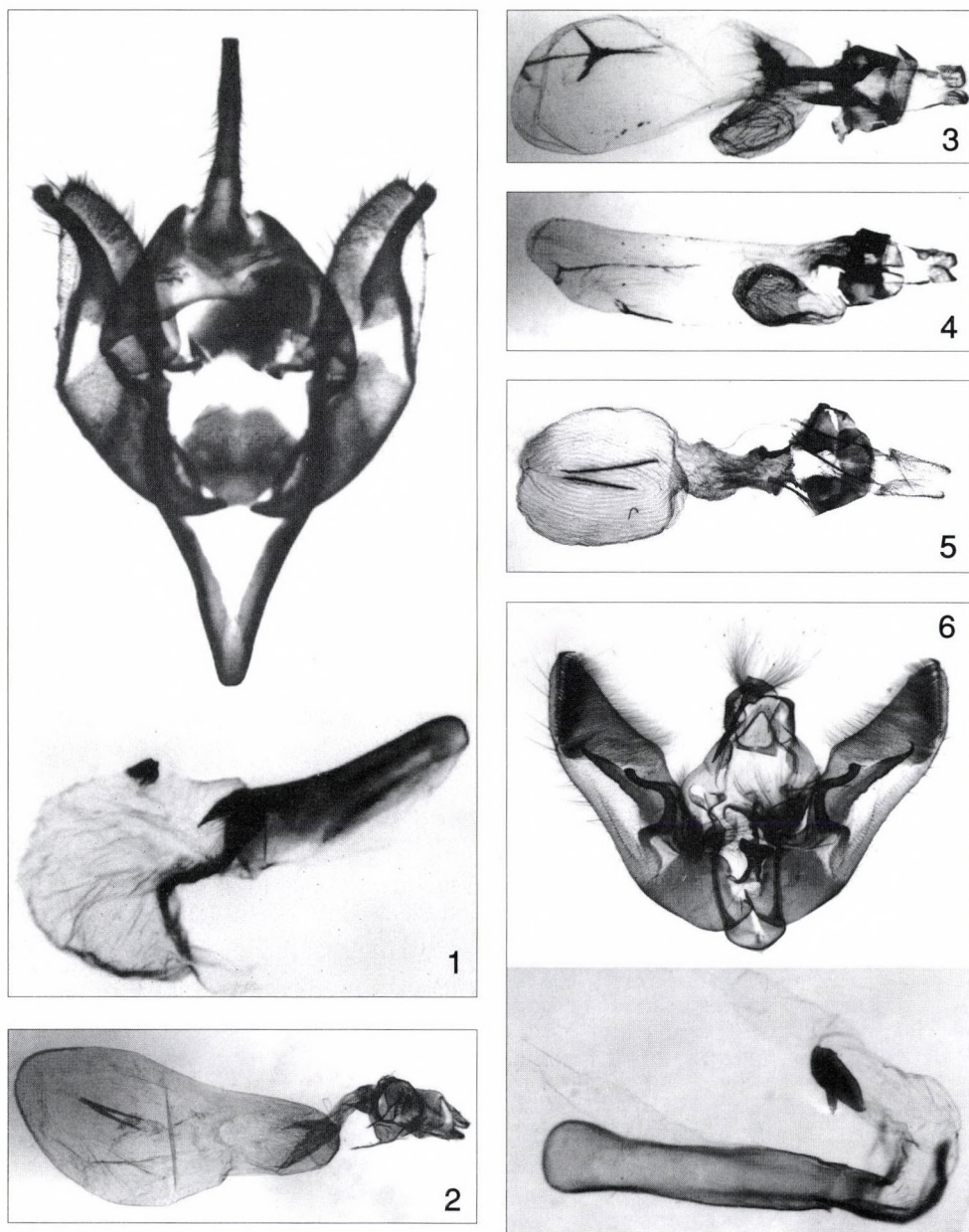
emodicola BOURSIN, 1968 and *H. punicea* SUGI, 1995. The members of this species-group are hardly distinguishable by external appearance but are satisfactorily separable by their genitalia. The colouration of the new species most resembles that of *H. consignata* but it is larger in size, and the hindwing is suffused with greyish brown, not transparent whitish. In addition, the forewing pattern is more diffuse, the stigmata are paler, smaller. The closest relative of the new species is *H. siamensis*, another Oriental species of the *consignata*-group, which has, in comparison with *H. sobeyi*, darker, reddish-brown forewing ground colour, paler, transparent hindwing and, in the male genitalia, more elongate, less pointed valva, narrower uncus, longer, basally narrower harpe, apically narrower fultura inferior, somewhat shorter vinculum; and an additional, small sclerotized plate at base of vesica.

The male genitalia of *H. sobeyi* (Fig. 1) can be distinguished from those of *H. consignata* by its apically less tapering valva with more rounded apex, longer harpe extending to tip of valva, somewhat larger, higher, apically more constricted fultura, thicker but shorter cornutus of vesica and the presence of an additional serrated subbasal lamina near the cornutus. The valval shape and the size of the harpe of *H. sobeyi* are more similar to those of *H. punicea* but the fultura is considerably larger, the serrated lamina of the carina is larger and stronger, the rugose field is significantly weaker and the cornutus and the additional serrated plate are present, these two sclerotized appendices are missing in *H. punicea*.

The female genitalia of *H. sobeyi* (Fig. 2) differ from those of *H. consignata* by the larger, longer, proximally less dilated ductus bursae, more elongate cervix bursae and larger corpus bursae with well-developed signum-stripes at fundus (a short fine stripe may also be present in *H. consignata*); and from those of *H. punicea* by its larger cervix bursae and the presence of long signum-stripes at fundus bursae.

The differences between the male genitalia of *H. sobeyi* and *H. emodicola*, the other species of the *H. consignata*-group having dark hindwings, are much larger, as *H. emodicola* has a rather different shape of valva, stronger, more robust harpe, the fultura inferior has well-developed dorsal process, etc.

Description: wingspan 28–33 mm, length of forewing 12–14 mm. Male. Head and thorax olive-brownish, collar and tegulae marked with ochreous and blackish brown lines, pro- and meta-thoracic tufts large, ochreous-brownish. Palpi slender, upturned, antenna filiform. Abdomen paler grey-brownish, dorsal crest reduced to a small tuft on second segment; anal tuft rather strong, dark brown. Forewing elongate, narrow, with apex rounded, outer margin evenly arcuate. Ground colour olive-brown with variably strong olive-greenish suffusion, strongest along costal margin. Cross-lines rather diffuse, double, dark brown filled with ochreous, marked with blackish. Subbasal and antemedial short, almost straight, latter angled strongly outwards at costal and inner margins; basal area spotted with blackish. Medial area rather broad, medial line diffuse dark grey shadow, postmedial arcuate, sinuous, relatively broad. Stigmata sharply defined, rather small, blackish-brown with ochreous-greyish annuli, orbicular round(ed), reniform more or less lunulate, claviform short, wedge-shaped. Subterminal diffuse, shadow-like, defined by indistinct grey-brownish chevrons,



Figs 1–6. Genitalia figures. 1+2 = *Hermonassa sobeyi* sp. n., paratypes; 3–4 = *Diarsia ypsiloidea* sp. n., 3 = holotype, 4 = paratype; 5 = *Dryobotodes formosanus* HREBLAY et RONKAY, female, Taiwan; 6 = *D. himalayensis* sp. n., paratype, male, Vietnam

terminal line fine, interrupted, blackish-brown, cilia as ground colour, with fine ochreous line at base. Hindwing slightly transparent, pale greyish brown, veins and marginal area somewhat darker, discal spot diffuse, small. Terminal line dark brownish, cilia as ground colour, with fine ochreous basal line and darker medial stripe. Underside of wings pale greyish brown, forewing suffused with darker brownish, traces of stigmata and discal spot of hindwing recognizable but regularly diffuse.

Male genitalia (Fig. 1): uncus slender, medium-long, slightly arcuate. Tegumen low, broad, fultura inferior large, rounded subdeltoidal, vinculum relatively long, V-shaped. Valva rather short, finely curved, margins more or less parallel, cucullus short, rounded triangular with apex pointed, margins strongly setose. Sacculus narrow, clavus reduced, harpe long, slender, sclerotized, distally slightly curved, extending to tip of valva. Aedeagus cylindrical, short, thick, carina with large, sclerotized, serrate lateral plate. Vesica rather short, inflated, distal part recurved dorsally, its walls membranous with fine scobination; basal part with rugose dorso-lateral field. Cornutus short, double- or triple-peaked, bulbed, sitting on short, narrow subbasal diverticulum situated near ventral end of carina.

Female genitalia (Fig. 2): ovipositor medium-long, conical, weak, antevaginal plate lyriform, sclerotized. Ostium bursae trapezoidal, rather short, granulosely sclerotized, ductus bursae tubular, membranous with longitudinal wrinkles, dilated proximally. Cervix bursae elongate, apically rounded, scobinate, with fine wrinkles, corpus bursae large, elliptical, membranous, with two medium-long, narrow signa laterally and two longer, similarly narrow signum-stripes at fundus bursae.

Bionomics and distribution. The major part of the type series was found at light in a large forest clearing between secondary and primary forest patches. Most specimens are rather worn, the date of the collectings (end of November–beginning of December) is probably the very end of the flight period of the species. A smaller number of specimens was collected in mid-May, but no observations of the species are known from the summer; most probably the species has a long period of aestivation.

Etymology: the new species is dedicated to Mr RICHARD SOBEY, country representative of Frontier-Vietnam.

***Diarsia ypsiloidea* sp. n.**

(Figs 3–4, 108)

Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay", slide No. RL6069 (coll. HNHN, Budapest).

Paratype: 1 female, with the same data as the holotype (coll. HNHN, Budapest).
Slide No. RL6181 (female).

Diagnosis: the new species is closely related to *D. hoenei* BOURSIN, 1954–*D. claudia* BOURSIN, 1963 species-group and most resembles the latter species. *D. ypsiloidea* can be distinguished from its relatives by its darker, less transparent hindwing and by the more unicolorous reniform stigma, with less expressed dark plumbeous-greyish spot at lower third. The unique feature of the female genitalia within this species-group is the short Y-shaped signum (Figs 3–4), in addition, the ostium bursae is broader, less calyculate with narrower sclerotized ring and

the ductus bursae is significantly shorter and weaker, than in *D. claudia*. The female genitalia of the new species differ from those of the other *Diarsia* species having also Y-shaped short signum (e.g. *D. odontophora* BOURSIN, 1954, *D. acharista* BOURSIN, 1954, *D. pseudacharista* BOURSIN, 1954, *D. eleuthera* BOURSIN, 1954; all from China) by their larger, longer, more or less V-shaped lateral bars of the ostium bursae, stronger lateral plates of ductus bursae and the stronger scobination of the cervix bursae.

Description: wingspan 37–40 mm, length of forewing 17–19 mm. Female. Head and inner sides of palpi ochreous, collar, thorax and forewing rufous brown with ochreous-orange suffusion, especially at costal area. Wing pattern diffuse, ante- and postmedial crosslines shadow-like, double, sinuous; medial line diffuse, dark stripe. Orbicular and reniform stigmata rather indistinct, somewhat paler than ground colour, encircled with ochreous and darker brown, lower part of reniform brownish-greyish. Subterminal obsolescent, pale yellowish, cilia rufous. Hindwing shining dark greyish brown, veins slightly darker, discal spot present but diffuse. Underside of wings shining ochreous grey, inner area of forewing and veins of hindwing darker brownish; transverse lines present, diffuse, discal spot of hindwing rather strong. Male unknown.

Female genitalia (Figs 3–4): ovipositor short, weak, posterior papillae anales short, more or less quadratic, gonapophyses slender, fine. Ostium bursae more or less calyculate with two sclerotized lateral bars forming long V, dorsal part of ostial ring with small, sclerotized medial lobe. Ductus bursae rather short, flattened, medially wrinkled with granular sclerotization laterally. Cervix bursae large, inflated, falciform with more or less globular, rugulose apical part, corpus bursae long, sacculiform, hyaline with fine scobination. Signa very characteristic, ventral surface with very long, fine signum-stripe running from middle of corpus bursae to fundus, dorsal signum much shorter but stronger, reversed Y-shaped with symmetrical proximal arms.

Bionomics and distribution. The two specimens were collected at light and are rather worn, the peak of the flight period of the species is presumably the end of the rainy season. However, the species was not found among the material collected by earlier expeditions in September–October in various parts of northern Vietnam, nor in the extensive recent collection made in February–March in the same area of the Fan-si-pan Mts, although five other bivoltine *Diarsia* species were represented in this latter sample.

***Dryobotodes himalayensis* sp. n.**

(Figs 6–8, 109, 110)

Holotype: female, “VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46.06'E, 22°20.9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay”, slide No. RL6200 (coll. HNHN, Budapest).

Paratypes. Vietnam: 1 male, with the same data as the holotype (HNHN, Budapest). Nepal: 1 male, Mechi, Taplejung area, above Hellok, 2700 m, 87°55'E, 27°34'N, 25.X.1996, leg. Gy. M. LÁSZLÓ & G. RONKAY (coll. G. RONKAY, Budapest).

Slide Nos RL5850, RL6018 (males).

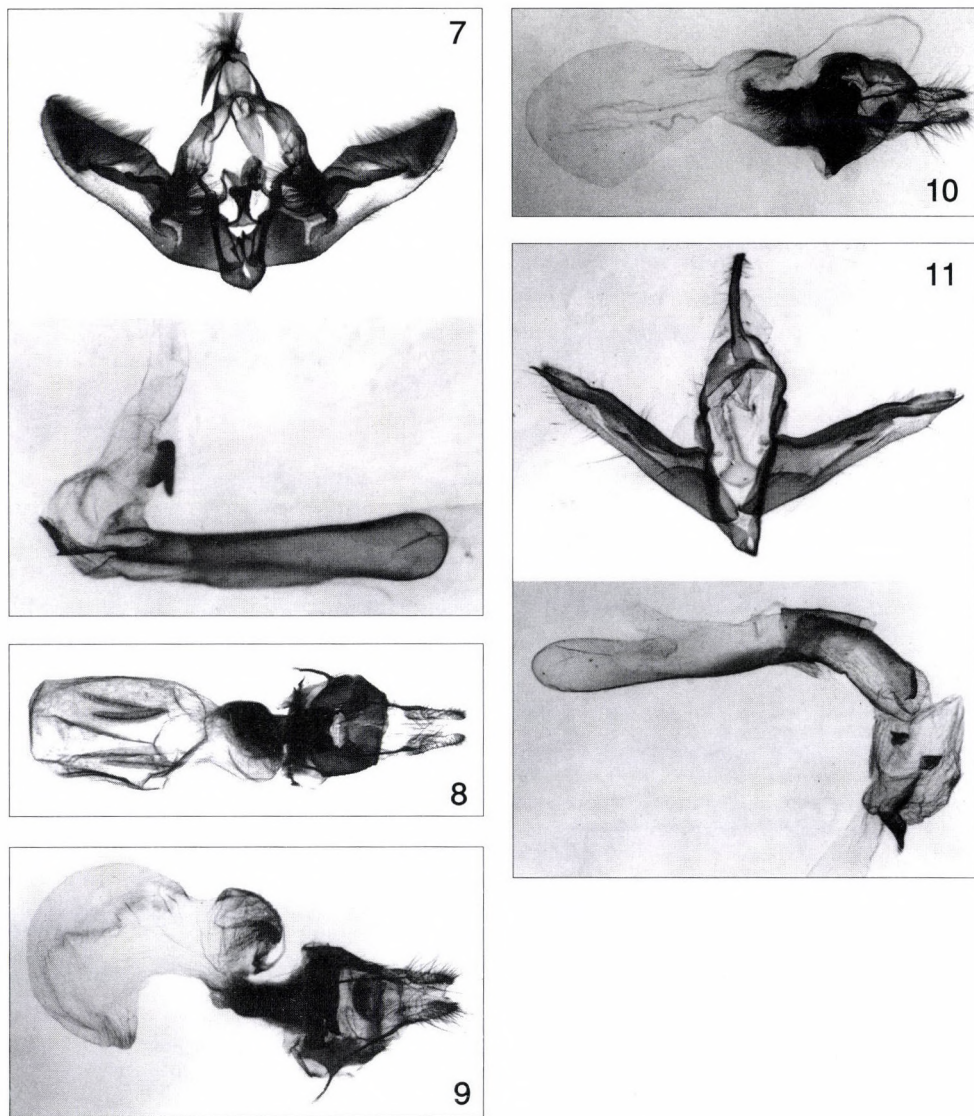
Diagnosis: the new species is similar to *D. formosanus* HREBLAY et RONKAY, 1998, and *D. cerriformis* HREBLAY et RONKAY, 1998, forming a small, compact species-group. *D. himalayensis* differs from its relatives by its larger size, longer, broader forewings with less greenish ground colour and by the lighter, more or less whitish filling of the orbicular and reniform stigmata. *D. himalayensis* also resembles the Chinese species *D. praetermissa* DRAUDT, 1950, but differs in details of the pattern and genitalia (see HACKER, 1990, p. 373, fig. 67a). The male genitalia of *D. himalayensis* (Figs 6–7) are similar to those of *D. formosanus* and *D. cerriformis*, being much closer to those of the former species but the valva of the new species are narrower, more elongate, the cucullus is longer with less acute apex, without well-developed ventral angle at the end of corona, the ampullar process is stronger, thicker, cuneate, the basal plate of the fultura is broader, apically less tapering, the vesica is considerably smaller, narrower, the distal cornutus is about half as short but with broader basal bulb. In *D. cerriformis* the uncus is lanceolate, the fultura inferior is with less developed apical plate, the valva is shorter, weaker, the harpe and the ampulla are shorter, weaker, the ventral bar of the carina is weaker and the cornutus is smaller. The male genitalia of *D. intermissa* differ from all three closely related species by the much broader fultura inferior, narrower, apically more tapering valva with shorter, triangular cucullus, more robust, apically curved harpe, thicker aedeagus with much stronger armature of carina and the cornutus being long, very fine, pin-like.

The female genitalia of the three species are very different, the sclerotization of the ostium and ductus bursae is much stronger in *D. himalayensis* (Fig. 8) than in the two related taxa, the well-developed large sclerotized plate of cervix bursae, present in the new species, is missing in *D. formosanus* (Fig. 5) and in *D. cerriformis*. In addition, *D. himalayensis* has four signa while *D. formosanus* has only two and *D. cerriformis* has none.

Description: wingspan 31–35 mm, length of forewing 15–17 mm. Male. Head and thorax dark blackish grey, mixed with brownish, mossy green and ochreous, collar and tegulae marked with blackish, abdomen grey; antenna of male shortly ciliate. Forewing elongate, relatively broad, with apex finely pointed, ground colour dark brownish grey, suffused with mossy green, irrorated with whitish and dark brown. Subbasal line short, double, black, ante- and postmedial crosslines fine, sinuous, double, blackish defined with some whitish. Orbicular and reniform stigmata large, incompletely encircled with blackish brown, both filled with whitish and a few small brownish dots; claviform represented by short, black streak. Suborbicular stigma conspicuous, oblique, white(ish), dark streak of medial area narrow, diffuse, dark brown-grey. Subterminal whitish, rather diffuse, defined by darker grey spots and patches; terminal line a row of blackish triangles. Hindwing shining white(ish), veins and narrow marginal area finely covered with brown, discal spot absent; cilia white. Underside of forewing suffused with brownish grey, that of hindwing white with a few darker scales on veins and marginal area. Female. As male but somewhat darker in colouration, forewing with less intense greenish irroration, hindwing with stronger grey-brown suffusion; antenna filiform.

Male genitalia (Figs 6–7): uncus short, slender, acute, sitting on large, sclerotized apical extension of tegumen. Tegumen high, relatively wide, penicular lobes large, rounded. Fultura inferior

small, sand-clock-shaped, with dentated, sclerotized apical plate, vinculum short, more or less rounded. Valva elongate, medially slightly dilated, forming small, triangular costal lobe. Cucullus broadly triangular, densely hairy, with apex pointed; corona long. Saccus short, rounded, clavus reduced to rounded, finely setose surface. Harpe strong, long, curved at middle in right angle, distal part concave, finely serrated. Ampullar process sclerotized, very long, cuneate, apically slightly hooked. Aedeagus medium-long, cylindrical, straight, carina with fine, long ventro-lateral bar ex-



Figs 7–11. Genitalia figures. 7–8 = *Dryobotodes himalayensis* sp. n., 7 = paratype, male, Nepal, 8 = holotype, female, Vietnam; 9 = *Himalistra jeleni* sp. n., holotype, female; 10 = *H. hackeri* HREBLAY et RONKAY, female, Nepal; 11 = *Nyctycia stenoptera violascens* ssp. n., paratype, male

tending far into vesica. Vesica tubular, narrow, relatively short, curved laterally near its base, distal half recurved in right angle. Its walls hyaline, armed with strong but short, acute terminal cornutus sitting on large, rounded, sclerotized basal plate.

Female genitalia (Fig. 8): ovipositor conical, rather strong, posterior papillae anales elongate, pointed, apophyses relatively long. Sternite VIII rather narrow, quadrate, with two strong, acute triangular processi at ostium bursae. Ostium bursae flattened, sclerotized, quadrangular with arcuate lateral edges, ductus bursae short, tubular, strongly scobinate. Cervix bursae large, globular, rugose, with big, strongly sclerotized ventro-lateral plate. Corpus bursae more or less elliptical, weakly membranous, with four rather broad signa.

Bionomics and distribution. The new species is known from northern Vietnam and eastern Nepal.

***Himalistra jeleni* sp. n.**

(Figs 9, 111)

Holotype: female, "VIETNAM, Prov. Lao Cai, 2540 m, Fan-si-pan Mts, 6 km W Sa Pa, 103°48,657'E, 22°17,814'N, 14.III.1998, leg. L. Peregovits & T. Vászárhelyi" (coll. HNHN, Budapest). Slide No. RL6164.

Diagnosis: the new species is a close relative of *H. hackeri* HREBLAY et RONKAY, 1995, *H. dimorpha* HREBLAY et RONKAY, 1995, and *H. simillima* HREBLAY et RONKAY, 1995, differing from each of those by its longer narrower forewing with apex less acute and larger, less flattened stigmata as well as some features of the female genitalia. The female genitalia of *H. jeleni* (Fig. 9) are close to those of *H. hackeri* (Fig. 10), having much larger intersegmental plate in the ovipositor, longer, significantly broader, more calyculate ostium bursae, narrower ductus bursae, larger, more scobinate cervix bursae and larger corpus bursae with falcate fundus.

Description: wingspan 38 mm, length of forewing 19 mm. Female. Head and thorax dark chocolate-brown, vertex and collar mixed with ochreous hairs, abdomen more greyish. Forewing elongated, relatively narrow triangular with apex pointed, ground colour dark brown with intense rosy-brown suffusion and ochreous irroration; costal area and termen ochreous brown. Basal dash short, diffuse, blackish, ante- and postmedial crosslines rather diffuse, double, sinuous, blackish brown filled with ochreous-brownish, medial line a dark brown shadow. Orbicular and reniform stigmata rather large, encircled with dark brown and ochreous, orbicular rounded, filled with ochreous, reniform elliptical with dark grey centre; claviform obsolete. Subterminal fine ochreous-greyish, less sinuous, defined by a few tiny dark spots at inner side, terminal line continuous, blackish, cilia as ground colour, its base somewhat lighter, more ochreous. Hindwing shining, grey-brown, its scaling finely reticulate, veins slightly darker, discal spot large, lunulate, diffuse. Terminal line dark grey, cilia orange-brownish, outer half spotted with darker brown. Underside of forewing suffused with dark brownish grey, veins and trace of reniform slightly darker, costal areas pinkish; that of hindwing pale ochreous grey, suffused with pinkish, irrorated sparsely with dark grey, veins covered with grey. Discal spot sharply defined, blackish, transverse line more diffuse but well discernible.

Female genitalia (Fig. 9): ovipositor short, conical, rather strong, with large, sclerotized, half-moon-shaped ventral plate, posterior gonapophyses long, slender. Ostium bursae wide but

short, dorsal plate heavily sclerotized, rounded trapezoidal, ventral plate smaller, shorter, triangular. Ductus bursae medium-long, posterior third dilated, more or less discoidal, gelatinous, anterior two-third broadly tubular, flattened, wrinkled, inner surfaces covered with short, fine spiculi. Cervix bursae semiglobular, rugose, with finer, shorter spiculi; corpus bursae spacious, broadly falciform, membranous with fine wrinkles and with long, finely sclerotized signum-stripe.

Bionomics and distribution. The unique specimen of the new species was found at the lower edge of the elfin forest zone, above 2500 m a.s.l., collected by a portable light trap placed on top of a rock standing above a deep, forested gorge.

Etymology: the new species is dedicated to Mr JÁNOS JELEN, former Hungarian Ambassador in Vietnam.

***Nyctycia stenoptera violascens* ssp. n.**
(Figs 11, 112)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest).

Paratypes: 14 males, 15 females, from the same locality, 29.XI., 4–6. and 8.XII.1997 (coll. HNHN, Budapest; BMNH, London; M. HREBLAY, Érd and G. RONKAY, Budapest); 2 males, 1 female, Prov. Lao Cai, Sa Pa, Deo Tram Ton, 1750 m, 14–15.I.1996, leg. K. HORIE & M. OWADA (NSMT, Tokyo).

Slide Nos NSMT2437, RL6021, RL6201 (males).

Diagnosis: the new subspecies differs from the nominotypical *N. stenoptera stenoptera* (SUGI, 1959) known from Japan by its broader forewings with conspicuous pinkish-violaceous suffusion and darkened, deep chocolate-brownish medial area. *N. stenoptera violascens* is larger in size than the Taiwanese subspecies, *N. s. minori* KOBAYASHI et OWADA, 1998 (wingspan 28–31 mm, length of forewing 13–15 mm), the basal and marginal areas are darker, violaceous with less expressed reddish definition along subterminal line, the medial area is also conspicuously darker, broader, the orbicular and reniform stigmata are more sharply defined.

The male genitalia of the Vietnamese subspecies differ from those of the nominotypical *N. s. stenoptera* by the armature of the vesica: *N. s. violascens* (Fig. 11) has a larger and two smaller, broad-based cornuti and an elliptical sclerotized plate covered by fine denticles while *N. s. stenoptera* has only two cornuti, a large and a considerably smaller and the sclerotized plate is covered with significantly longer spiculi.

Bionomics and distribution: the species is rather widespread along the Pacific Coast, known from Japan, Taiwan and from the northern mountain region of Vietnam, represented by three, easily separable geographic subspecies. The rather large series found in Vietnam consists of freshly emerged specimens, the

species is a typical member of the early winter period; no overwintering moths were found in February–March.

***Nyctycia dissimilis* sp. n.**

(Figs 12, 113)

Holotype: male, "Thailand, Doi Inthanon, 18°34'N, 98°59'E, GPS, 2300 m, 17.I.1997, Malicky", slide No. HACKER 10577 (coll. H. HACKER, Staffelstein).

Diagnosis: the new species is a close relative of *N. consimilis* HREBLAY et RONKAY, 1998 and *N. asymmetrica* HREBLAY et RONKAY, 1998, these three species form a very compact group within the *N. persimilis* (HAMPSON, 1894)-line. Members of the group are often confusingly similar externally, the new species differs from the allied taxa by its smaller, flattened orbicular and paler, whitish-ochreous reniform stigmata and the less darkened medial area. The male genitalia of *N. dissimilis* (Fig. 12) differ from those of its sibling species by its less asymmetrical distal parts of valvae with more separated cuculli and shorter, rounded extensions, the fultura inferior is apically more tapering, without strong apical process, the vesica is much weaker, membranous, almost discoidal, with a large, bird-head-like basal cornutus which is absent in the other two relatives.

Description: wingspan 31 mm, length of forewing 14 mm. Male. Head and thorax dark brown, vertex and collar mixed with ochreous hairs, collar with diffuse dark stripe; antenna very shortly ciliate. Forewing elongate, relatively narrow, with apex pointed, dark brown, basal area with fine rosy-brown suffusion, marginal area with ochreous irroration, especially at inner half. Basal area broad, subbasal line short, weak. Ante- and postmedial crosslines rather sharply defined, double, sinuous, blackish brown filled with ochreous, medial line fine, narrow dark brown shadow. Orbicular and reniform stigmata encircled with ochreous and a few dark brown scales, orbicular flattened, filled with brownish grey, reniform elliptical, whitish-ochreous with dark grey scales at inner side; claviform short, blackish grey. Subterminal fine, interrupted, ochreous-greyish, defined by diffuse dark spots; terminal line more or less continuous, dark brown, cilia as ground colour, spotted with ochreous. Hindwing dark, concolorous grey-brown, discal spot diffuse but visible. Terminal line dark grey, cilia pinkish-ochreous with dark medial line. Underside of forewing suffused with dark brownish grey, discal spot and transverse line diffuse, darker, that of subterminal an ochreous stripe. Hindwing ochreous-greyish, irrorated with pinkish and dark grey-brown, basal dash, discal spot and transverse line dark, rather strong.

Male genitalia (Fig. 12): uncus short, flattened, apical part slightly spatulate. Tegumen narrow, relatively low, fultura inferior sclerotized, subdeltoidal, vinculum strong, V-shaped. Valvae almost symmetrical except cuculli which are elongate, distally tapering, costa heavily sclerotized. Cuculli narrow, more or less foot-shaped with apex rounded, dorso-lateral margin of right cucullus with larger, rounded double-peaked, that of left cucullus with smaller, triple-peaked, heavily sclerotized lobe. Saccus large, sclerotized, clavus reduced, harpe represented only by its narrow, sclerotized basal plate, ampulla a rounded protuberance on larger flat plate. Aedeagus long, cylindrical, distal third curved ventrally, carina with two flattened, dentate-scobinate ventro-lateral bars. Vesica discoidal-globular, membranous, with large, bird-head-like basal cornutus; ductus ejaculatorius originating close to base of vesica.

Bionomics and distribution. The species is the easternmost member of the *N. persimilis*-line, the unique type was found at a relatively high altitude in mid-January.

***Nyctycia szabokyi* sp. n.**

(Figs 13–14, 114–115)

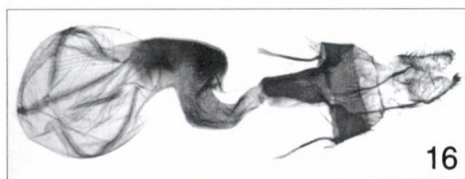
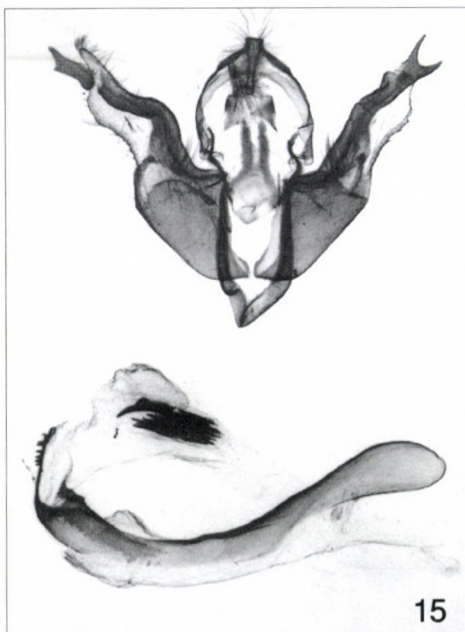
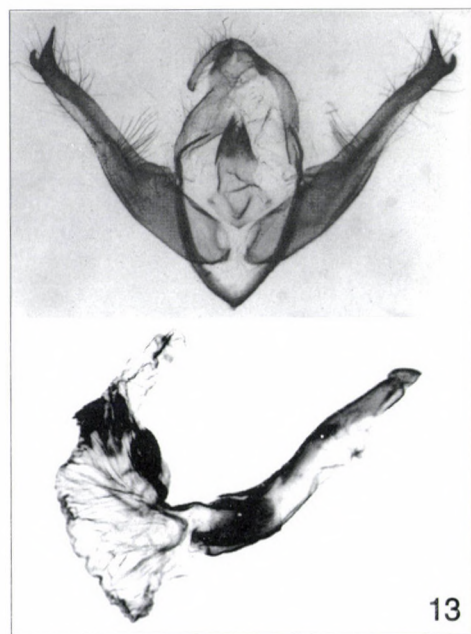
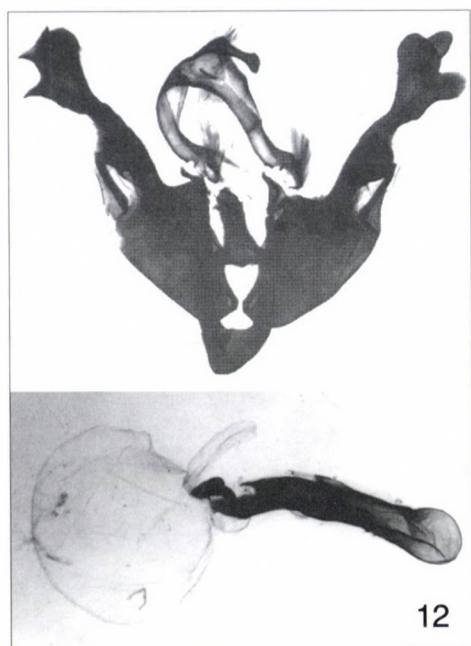
Holotype: male, "THAILAND, Changwat Mae Hong Song, 21 km NW of Pai, 1360 m, 7.II.1998, leg. Márton Hreblay & Csaba Szabóky", Slide No. HM11237 (coll. HREBLAY, Érd).

Paratypes. Thailand. 1 female, with the same data as the holotype. Prov. Nan: 3 females, 30 km E of Pua, 1700 m, 27.II. and 1.III.1998, leg. M. HREBLAY et Cs. SZABÓKY; 3 males, 3 females, 30 km E of Pua, 1700 m, 10. & 13.XII.1998; 2 females, 25 km N of Bo Luang, 1150 m, 11.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS. Prov. Chiang Mai: 1 female, Mt. Doi Inthanon, NP, 2300 m, 2.XII.1998; 1 male, 1 female, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 8. & 18.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. HNHM, CSÓVÁRI, Érd, HREBLAY, Érd, PLANTE, Martigny).

Slide Nos HM10724, HM10728, HM10742 (females), HM11258, HM11259 (males).

Diagnosis: the new species is a close relative of *N. angustipennis* YOSHIMOTO, 1993, although in its external appearance resembles a very small, pale *N. strigidisca* (MOORE, 1882) or *N. stenoptera*. It differs from these two species by its smaller size, narrower, shorter forewings with paler ground colour and less darkened medial area and the lighter ground colour of the hindwing, and from *N. angustipennis* by its much darker forewings with more diffuse dark markings and the absence of the pinkish suffusion. The male genitalia of *N. szabokyi* (Fig. 13) are similar to those of *N. angustipennis* (see YOSHIMOTO, 1993, Fig. 294) but the valvae are narrower, the processi of the cuculli are more curved, the fultura inferior, especially its apical half is much broader and the cornuti field of the vesica is considerably smaller.

Description: wingspan 24–26 mm, length of forewing 11–12 mm. Male. Head and thorax dark brown, vertex and collar mixed with ochreous and blackish hairs, metathorax with ochreous crest; antenna very shortly ciliate. Forewing relatively short, narrow, with apex pointed, ground colour tobacco-brown, costal and basal field and inner half of marginal area with ochreous irroration, outer part of marginal area dark grey-brown, darkest part of wing. Ante- and postmedial cross-lines double, sinuous, blackish brown filled with ochreous, medial line diffuse brownish shadow. Orbicular and reniform stigmata large, rounded, incompletely encircled with ochreous and blackish brown, orbicular filled with brownish grey, reniform filled with whitish-ochreous with dark grey inner lunule; claviform represented by fine, short, blackish grey apical arch. Subterminal fine, interrupted, ochreous-greyish, forming W-mark at outer angle of cell; defined by fine brown and blackish chevrons and streaks. Terminal line row of tiny blackish arches, cilia as ground colour, spotted with ochreous. Hindwing whitish, irrorated with brownish grey, veins darker, discal spot and transverse line diffuse but visible. Terminal line dark, cilia whitish-ochreous, spotted with brown. Underside of wings ochreous-whitish, forewing with stronger, hindwing with weaker brownish grey irroration, discal spots present, rather strong, that of forewing with whitish centre; transverse line diffuse but well discernible. Female. As male but medial area with stronger dark brownish suffusion, hindwing paler, more whitish with sharper discal spot and transverse line; antenna filiform.



Figs 12–16. Genitalia figures. 12 = *Nyctycia dissimilis* sp. n., holotype, male; 13–14 = *N. szabokyi* sp. n., 13 = holotype, male, 14 = paratype, female; 15–16 = *N. nivescens* sp. n., 15 = holotype, male, 16 = paratype, female

Male genitalia (Fig. 13): uncus short, weak, apically flattened, tegumen medium-high, relatively wide, penicular lobes narrow. Fultura inferior rather weak, large, broadly subdeltoidal with rounded medial prominence; vinculum short, slender, V-shaped. Valvae symmetrical, elongate, narrow, apically tapering, cucullus small, sclerotized, with long, acute apex and shorter, slightly arcuate, acute pollex. Saccus narrow, long, clavi reduced, harpe represented by its short basal plate. Aedeagus cylindrical, distal end arcuate, carina with long ventral plate. Vesica broadly tubular, membranous, curved ventrally, with conical frontal diverticulum, sclerotized, cristate, partly folded plate at inner curve, medial third with semiglobular lateral diverticulum, distal third with rounded cornuti field consisting of strong, acute spinules.

Female genitalia (Fig. 14): ovipositor conical, weak, apophyses slender, fine. Ostium bursae long, flattened, more or less trapezoidal with rounded, constricted anterior part. Ductus bursae short, flattened, sclerotized, cervix bursae large, sclerotized-folded, apically wrinkled, corpus bursae elliptical-saccate, membranous with fine wrinkles and four long, narrow, ribbon-like signa.

Etymology: the new species is dedicated to Mr CSABA SZABÓKY, the talented Hungarian microlepidopterist.

***Nyctycia nivescens* sp. n.**

(Figs 15–16, 116–117)

Holotype: male, "VIETNAM, Prov. Vinh Phu, Tam Dao, 1200 m, 105°39,24'E, 21°27,72'N, 11–13.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6020.

Paratypes: 2 males, 3 females, with the same data as the holotype (coll. HNHM, Budapest); HREBLAY, Érd & G. RONKAY, Budapest).

Slide No. RL6203 (female).

Diagnosis: *N. nivescens* is a sibling species of *N. adnervis* KOBAYASHI et OWADA, 1998, differing from it by its generally darker colouration, especially the outer half of the forewing which is darker rosy-brownish, not whitish or whitish green, the basal area is also darker greenish, irrorated with brownish, only the filling of the antemedial line is conspicuously whitish, the postmedial line is not angled outwards at tornus, the dark stripe running from claviform to tornal edge is restricted to a darker patch inside medial area, the filling of the reniform is not whitish-greenish but ochreous brown, and the costal area of the hindwing is darker, without whitish zone.

The male genitalia of the two species are very dissimilar, as the valvae of *N. nivescens* (Fig. 15) are only slightly asymmetrical, the fultura inferior is with long apical extensions but without dentate apex, the aedeagus is much narrower with strongly dentate dorsal bar of carina, the armature of the vesica consisting of a large cornutus on a conical medial diverticulum and a large terminal cornuti field. The female genitalia of the new species (Fig. 16) differ from those of *N. adnervis* (the genitalia of this species are illustrated by KOBAYASHI et OWADA, 1998, Figs 11, 17) by its much longer, narrower ostium bursae, less sclerotized, scobinate ductus bursae, narrower, more conical cervix bursae with somewhat stronger sclerotization at apical third and proximo-laterally. It also differs from

two other related species, *N. latibasalis* (WARREN, 1913) and *N. endoi* (OWADA, 1983) by its much shorter ostium bursae (it is about half as long as in *N. latibasalis* and *N. endoi*), weaker, unsclerotized ductus bursae and by its larger, more sclerotized cervix bursae.

N. nivescens is allied also to *N. shelpa* YOSHIMOTO, 1993 but is smaller in size, the ground colour of the forewing is not entirely greenish, the medial and marginal fields are darker, the elements of the forewing pattern and the genitalia of both sexes are conspicuously different (see Fig. 15. and YOSHIMOTO, 1993, Fig. 293).

Description: wingspan 28–30 mm, length of forewing 13–15 mm. Male. Head and collar dark greyish brown mixed with greenish and black, pubescence of thorax thick, dark mossy green, tegulae marked with a few blackish hairs. Palpi short, porrect, red-brownish, antenna very shortly ciliate. Abdomen dark grey-brown or blackish brown, dorsal crest reduced to a few small blackish tufts on first segments. Forewing relatively short, broad, apex finely pointed. Basal area broad, bright mossy green, base of wing dark red-brown or chocolate-brown, subbasal line double, filled with white. Antemedial line oblique, almost straight, double, filled with pale green or whitish green, other parts of wing outside antemedial line dark reddish brown with intense cupreous-red-dish iridescence. Medial area narrow, constricted strongly below cell, medial line diffuse brownish shadow, postmedial line arcuate, double, sinuous, blackish filled with ground colour. Orbicular and reniform stigmata rather small, laterally flattened, encircled partly with blackish and ochreous lines, former filled with plumbeous, latter with red-brownish and a few ochreous scales; claviform a rounded black(ish) spot. Subterminal rather indistinct, sinuous, whitish-ochreous, marked by a few greyish and darker brownish patches. Terminal line fine, interrupted, blackish grey, cilia as ground colour. Hindwing dark blackish brown, discal spot and transverse line slightly darker; terminal line ochreous, cilia as ground colour. Underside of both wings blackish brown, irrorated variably strongly with pinkish-ochreous, transverse lines and discal spots well marked. Female. As male but more robust, thorax and base of forewing paler, more vivid greenish, filling of antemedial more conspicuous, silvery-whitish, outer part of wing lighter, more pinkish, hindwing and especially the underside of wings paler; antenna filiform.

Male genitalia (Fig. 15): uncus short, rather weak, broader at base, tapering apically, tegumen medium-high, relatively wide, penicular lobes very small, narrow. Fultura inferior large, broad, rounded subdeltoïdal with two long, narrow apical extensions; vinculum short, strong, V-shaped. Valvae asymmetrical, elongate, slightly constricted, angled medially, costa heavily sclerotized. Right valva narrower, less angled medially, cucullus shorter, costal extension strongly bifurcate. Sacculus narrower, higher, clavus reduced to setose surface, harpe represented by its short basal plate, situated relatively far from ventral margin. Left valva larger, curved medially near in right angle, cucullus longer, acute, costal extension shorter, only slightly bifurcate. Sacculus broader but lower, clavus reduced to setose surface, basal plate of harpe placed at ventral margin. Aedeagus long, cylindrical, arcuate, carina with small, dentate ventral plate, short sclerotized lateral plate on left side and a much longer, eversible dorso-lateral lamina terminating in dentate plate covered with long, narrow teeth. Vesica broadly tubular, membranous, everted ventrally, recurved, medial third with semiglobular lateral diverticulum armed with acute, strong terminal cornutus, distal third tapering, with large subterminal cornuti field consisting of strong, acute spines.

Female genitalia (Fig. 16): ovipositor conical, rather weak, apophyses slender, fine. Ostium bursae quadrangular, flattened with trapezoidal, sclerotized ventral plate, ductus bursae tubular, curved, membranous with rather strong scobination and wrinkles. Cervix bursae elongate with rounded-conical apex, its walls sclerotized and partly cristate-rugose; corpus bursae globular, membranous with fine wrinkles and four long, ribbon-like signa.

Bionomics and distribution. This is the only *Nyctycia* species discovered in Vietnam outside the Fan-si-pan area. *N. nivescens* was found in the lower part of the oak-forest zone in the Tam Dao Mts. All six specimens were collected at light in the early evening, in rather cool, rainy weather on a night when only twenty moths came to light.

***Nyctycia endoi hiemalis* ssp. n.**
(Figs 17–18, 118)

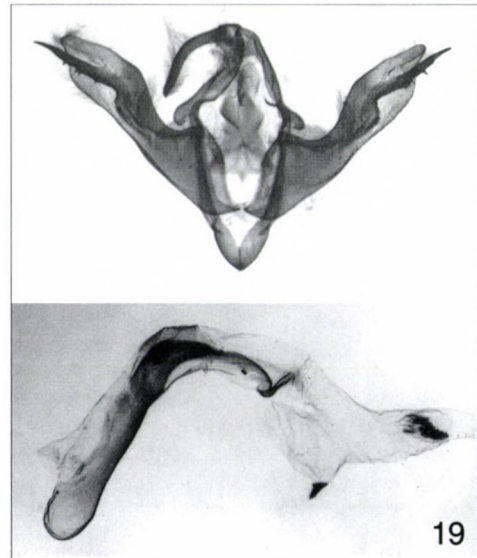
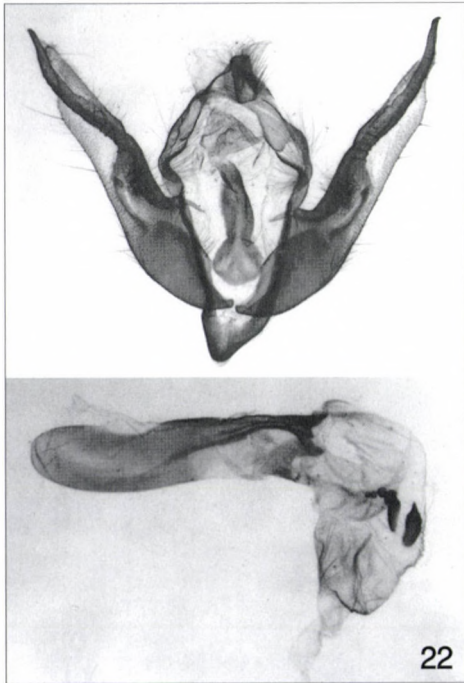
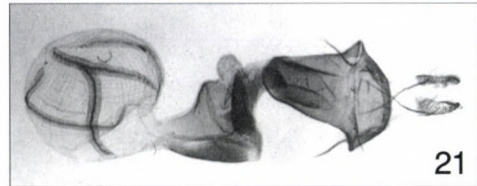
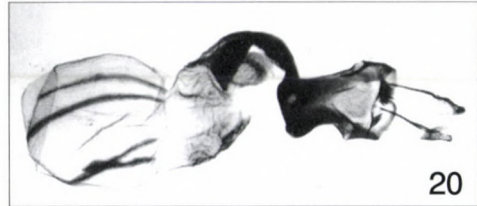
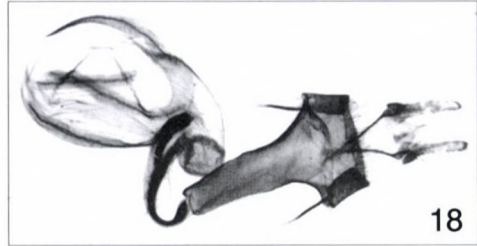
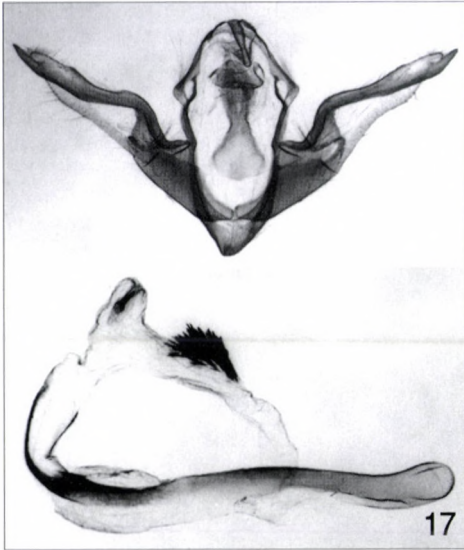
Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest). Slide No. RL6019.

Paratypes. Vietnam. 1 male, 2 females, from the same locality, 4–6.XII. and 8.XII.1997 (coll. HNHN, Budapest; M. HREBLAY, Érd and G. RONKAY, Budapest). Thailand. 1 female, Prov. Chiang Mai, Mt. Doi Inthanon, NP, 2300 m, 2.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. HREBLAY, Érd).

Slide No. HM11267, RL6202 (females).

Diagnosis: the new subspecies differs from typical populations of *N. endoi* (OWADA, 1983) by its larger size, darker colouration with less conspicuous reniform stigma; from *N. latibasalis* (WARREN, 1913) by its smaller size, shorter, broader forewings, less conspicuous, more ochreous-pinkish reniform stigma, less intense, darker greenish basal and marginal suffusion and significantly darker hindwing, especially in case of the male. The genitalia of both sexes (Figs 17–18) show no conspicuous differences between the two subspecies. The genitalia of the closely related *N. latibasalis* are very close to those of *N. e. endoi* and *N. e. hiemalis*, but in the males the fultura inferior is broader medially and slightly narrower basally, the valva is somewhat more strongly sclerotized, the medial diverticulum of the vesica is much larger, in females, the ostium bursae is shorter, the ductus bursae, especially its proximal half is stronger, broader.

Description: wingspan 24–28 mm, length of forewing 11–13 mm. Male. Body strong, rather short, head and thorax dark mossy green mixed with grey and blackish, collar marked with fine black line at middle. Palpi short, slightly upturned, antenna filiform. Abdomen greyish, dorsal crest reduced to a few minute tufts. Forewing relatively short, broad, apex finely pointed. Ground colour mossy green, medial area and outer edge of wing significantly darker, suffused with dark reddish brown and pinkish, basal area irrorated with dark grey. Basal area broad, antemedial line oblique, double, although most parts of inner line obsolete, less sinuous, blackish brown. Medial area narrow, constricted below cell, with dark grey-brownish patch running from claviform to postmedial line. Medial line weak brownish shadow, postmedial line double, sinuous, blackish brown filled with greenish. Orbicular and reniform stigmata large, incompletely encircled with blackish brown and ochreous lines, filling of orbicular pinkish brown, that of reniform ochreous mixed with pinkish brown scales; claviform small, rounded, blackish brown. Subterminal rather indistinct, waved, whitish-ochreous, marked with a row of diffuse reddish patches. Terminal line very fine, dark grey, cilia greenish mixed with dark grey. Hindwing concolorous dark greyish brown. Underside of wings dark greyish brown, irrorated with pinkish-ochreous, transverse lines and discal spots well



Figs 17–22. Genitalia figures. 17–18 = *Nyctycia endoi hiemalis* ssp. n., 17 = holotype, male, 18 = paratype, female; 19–20 = *N. ionochlora* sp. n., paratypes; 21 = *N. hoenei* (BOURSIN), female, Japan; 22 = *N. albivariegata* sp. n., paratype, male

visible. Female. As male but larger in size, its colouration more vivid, forewing with stronger pinkish suffusion, hindwing with paler costal part, stronger discal spot and transverse line, underside paler with more intense pinkish suffusion.

Male genitalia (Fig. 17): uncus short, weak, flattened, tegumen low, narrow, penicular lobes reduced to very small, arcuate lobes. Fultura inferior large, rounded subdeltoidal, with very long, medially dilated, flattened apical process; vinculum strong, short, V-shaped. Valvae symmetrical, long, distally tapering, medial part dilated, forming rounded costal lobe. Costal margin strongly sclerotized towards cucullus, subapical costal process medium-long, strong, acute. Cucullus small, weak, narrow triangular with apex pointed; corona absent. Sacculus short, narrow, clavus reduced to a small surface covered by a bundle of sensory setae. Harpe represented by its narrow, short basal bar, pulvillus long, narrow, densely setose, ampulla fine, digitiform, hyaline. Aedeagus long, straight, tubular, carina with small, dentate ventral plate, short lateral plate on left side and a much longer, eversible, sclerotized ribbon. Vesica narrow tubular, membranous, everted ventrally, recurved to proximal end of aedeagus. Basal third hyaline, medial third with long, tubular ventro-medial diverticulum armed with fine, broad-based apical cornutus, distal third of vesica slightly tapering, hyaline with fine scobination and with small semiglobular diverticulum covered with long, fine spinules.

Female genitalia (Fig. 18): ovipositor short, rather strong, conical, posterior papillae elongate, narrow, apophyses slender, fine. Ostium bursae large, flattened, sclerotized, more or less T-shaped with convex posterior margin ventrally. Ductus bursae tubular, medium-long, flattened, with heavily sclerotized lateral margin and a small plate at cervix bursae on ventral surface. Cervix bursae elongate, finely sclerotized, with rounded, strongly rugose, membranous apical part, corpus bursae elliptical-globular, weakly membranous, with fine wrinkles and four broad, long, ribbon-like signa.

Bionomics and distribution. The typical populations of *N. endoi endoi* appear as endemic to Taiwan, the Indo-Chinese subspecies is known from the type locality and from the Doi Inthanon Mts.

***Nyctycia ionochlora* sp. n.**

(Figs 19–20, 119)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 29.XI.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest).

Paratypes. Vietnam. 12 males, 7 females, from the same locality, 29.XI, 4–6. and 8.XII.1997 (coll. HNHN, Budapest; BMNH, London; M. HREBLAY, Érd and G. RONKAY, Budapest). Thailand. Prov. Chiang Mai: 4 females, Mt. Doi Inthanon, NP, 2300 m, 11. & 19–20.XI.1998, leg. T. CSÖVÁRI & L. MIKUS; 1 male, 1 female, Mt. Doi Inthanon, NP, 2300 m, 2.XII.1998; 4 males, Mt. Doi Phahompok, 18 km NW of Fang, 2100 m, 7. & 17.XII.1998; 4 males, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 8. & 18.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS. Prov. Nan: 2 males, 2 females, 30 km E of Pua, 1700 m, 16. & 18.XI.1998, leg. T. CSÖVÁRI & L. MIKUS; 3 males, 3 females, 30 km E of Pua, 1700 m, 10. & 13.XII.1998; 2 females, 25 km N of Bo Luang, 1150 m, 11.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. CSÖVÁRI and HREBLAY, Érd).

Slide Nos HM11252, HM11272, RL6022 (males), RL6204 (female).

Diagnosis: the new species is rather unique within the genus with its pale pinkish-ochreous ground colour with very narrow green(ish) medial area, no

similar *Nyctycia* species is known. The male genitalia show similarities with those of members of the *N. persimilis*, *N. strigidisca* and *N. latebasalis* species-groups, but also display good distinctive features. *N. ionochlora* (Fig. 19) differs from the taxa of the *N. persimilis* group mainly by its very different, shield-like fultura inferior without strong lateral arms, reduced tooth of the carina, the presence of a large medial diverticulum armed with a short but strong cornutus and by its much smaller terminal cornuti field of the vesica; from the members of the *N. strigidisca* group by its apically dilated, weaker valva, longer, strongly dentate costal extension and the reduction of the basal-medial cornuti of the vesica. The closest relatives of the new species, based on the structure of the vesica, are *N. latebasalis* and *N. endoi* but the tube of the vesica is broader, the cornutus larger, the long extension of the carina is stronger, distally curved and folded in *N. ionochlora*, the aedeagus is thicker, with a stronger dentate field on the opposite bar of the carina. In addition, the valvae of *N. ionochlora* are broader but shorter, the costal extension is much longer, narrower with more acute apex and strong dentition.

The female genitalia of the new species (Fig. 20) are most similar to those of *N. hoenei* (BOURSIN, 1958) but the ostium bursae is stronger, its anterior part more quadrangular, not tapering, the ductus bursae is considerably longer, stronger, the cervix bursae is weaker, without strong sclerotization. The other related species, *N. latibasalis* and *N. endoi* have much longer, narrower ostium bursae, narrower, less sclerotized ductus bursae, and their cervix bursae are smaller, rounded with finer wrinkles.

Description: wingspan 30–34 mm, length of forewing 14–16 mm. Sexes similar. Body strong, head and thorax dark pinkish-ochreous mixed with pale brownish, vertex and collar mossy green. Palpi short, slightly upturned, antenna of male very shortly ciliate, that of female filiform; abdomen dark ochreous-brownish, dorsal crest reduced to minute ochreous tufts, lateral ridges also pinkish-ochreous. Forewing elongate, relatively narrow, with apex finely pointed. Ground colour pale pinkish-ochreous, irrorated with fine red-brownish, scaling finely reticulate. Upper part of basal field and medial area suffused with vivid moss-green, medial and anal veins spotted with plumbeous grey. Basal area broad, subbasal line short, dark brown. Ante- and postmedial lines rather diffuse, double, less sinuous, reddish brown, former obliquely arcuate, latter S-shaped. Medial area narrow, constricted strongly below cell, medial line fine, narrow brown stripe. Orbicular and reniform stigmata rather small, incompletely encircled with greenish-brownish, former more or less rounded, pinkish with a few plumbeous, latter elliptical, filled with dark plumbeous-bluish scales; claviform a small red-brownish patch. Subterminal rather indistinct, green, defined with pinkish brown and plumbeous spots and patches, terminal line very fine, grey, cilia as ground colour, spotted with darker grey and brown. Hindwing dark brownish-grey, veins, discal spot and transverse line somewhat darker. Terminal line dark brown, cilia pinkish-ochreous with dark medial line. Underside of wings shining ochreous, irrorated with dark brown-grey and rosy-pinkish, medial part of forewing suffused with darker grey. Transverse lines and discal spots conspicuous, dark grey.

Male genitalia (Fig. 19): uncus long; rather thick, curved at middle, tegumen high, relatively wide, penicular lobes small, lobate. Fultura inferior large, broad, subtriangular with fine triangular basal extension and a more or less rounded, slightly folded apical lamina; vinculum strong but short, thick, V-shaped. Valvae symmetrical, elongate, constricted at middle, distally slightly di-

lated. Cucullus small, elongated-triangular with apex pointed; corona absent. Subapical costal process heavily sclerotized, long, straight, acute, irregularly dentate. Saccus short but high, rounded, clavus reduced to setose surface, harpe represented by its short basal plate, pulvillus densely setose. Aedeagus rather long, straight, cylindrical, carina with two strongly sclerotized lateral plates. Left one rather short, broad, apically covered with long spinules, right one much longer, eversible, extending into basal third of vesica, terminating in folded, wrinkled bar. Vesica broadly tubular, membranous, everted ventrally, basal third hyaline, medial third finely scobinate, with large, semi-globular diverticulum armed with strong, short, acute cornutus, distal third tapering, armed with subterminal, rounded spinulose field covered with fine spinules.

Female genitalia (Fig. 20): ovipositor short, rather strong, apophyses short, strong. Ostium bursae large, trapezoidal, heavily sclerotized, with pocket-like appendices at lateral end. Ductus bursae long, broadly tubular, flattened, ribbon-like, both surfaces strongly sclerotized. Cervix bursae large, conical, partly strongly ribbed, corpus bursae more or less globular, weakly membranous, with four long, ribbon-like signa.

Bionomics and distribution. The species was collected in Vietnam at light on the edge of primary and secondary forest patches at about 2000 m a.s.l., specimens were also found in the material collected by portable light traps placed along a small path running into the forest. It is worth mentioning that the species was never observed at light in the first short flight period at dusk when numerous winter species are usually found but appeared regularly around midnight within a rather limited time period. *N. ionochlora* was collected also in the northern and north-eastern mountainous regions of Thailand, sometimes at relatively low altitudes, slightly over 1000 m a.s.l.

Nyctycia albivariiegata sp. n.

(Figs 22–23, 120)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 29.XI.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest).

Paratypes: 4 males, 7 females, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. PEREGOVITS & L. RONKAY (HNHM, Budapest; BMNH, London; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos RL6023, RL6247 (males), RL6205 (female).

Diagnosis: the new species, together with *Nyctycia plumbeomarginata* (HAMPSON, 1895) (**comb. n.**), described from Burma and with *N. niveifera* sp. n., found in Thailand, form a small, well-defined species-group within the genus. The first two taxa are very closely related and very similar in their external and genital features, while *N. niveifera* is more distant from them, representing their sister-species. This latter species is larger in size with reduced whitish forewing pattern, the reniform stigma and the subterminal line are obsolete, the hindwing is less concolorous, its basal area paler, with darker veins, the collar is completely white but the thoracic crest is blackish. In the female genitalia the ostium bur-

sae of *N. albivariiegata* (Fig. 23) is larger, broader, more tapering proximally than in *N. niveifera* (Fig. 24) the ductus bursae is weaker, membranous-scobinate, strongly dilated proximally, with a sclerotized cristate plate, and the cervix bursae is much smaller, weaker, without stronger sclerotized laminae.

N. albivariiegata differs externally from *N. plumbeomarginata* by its generally darker colouration with significantly larger black and plumbeous grey patches and fields. In the male genitalia there are several characters that differ in the two species, the most conspicuous differences can be found in the overall shape of the tip of the valva, the shape and length of the costal extension and its position on the valva and the shape and size of the fultura inferior. The distal part of the valva is more tapering in *N. albivariiegata*, the very small, subapical costal process is missing, the apex is longer, narrower, more acute than in *N. plumbeomarginata* (Fig. 171). The costal extension of the new species is narrower at base, its medial part running almost parallel with costal margin, and the apical third is less curved, extending not so far over the tip of the valva. The fultura inferior of *N. albivariiegata* is smaller, its basal (ventral) plate is smaller, more rounded than in *N. plumbeomarginata*. In addition, the new species has apically broader uncus, stronger dorsal bar of the carina and the vesica is armed with five-six cornuti of decreasing size positioned slightly differently on the vesica than in *N. plumbeomarginata*.

Description: wingspan 28–30 mm, length of forewing 13–14 mm. Male. Body slender, head and thorax velvet black, vertex, base of collar, pro- and metathoracic tufts milky white, the latter may also be plumbeous or rosaceous. Palpi very short, porrect, black, antenna very shortly ciliate. Abdomen black with milky white hairs at base, dorsal part of last segment and anal tuft white or rosaceous. Forewing relatively short, broad, apex pointed, ground colour velvet black, basal area, lower part of medial field and inner half of marginal area brilliant silky white, irrorated with yellowish and a few black scales; ground colour confined to medial area and parts of marginal field. Marginal area often suffused with rosaceous and a few plumbeous scales, outer part of cell and marginal area irrorated with plumbeous. Crosslines absent but their positions marked by sharp edges of differently coloured parts of wing. Subbasal represented by a few blackish scales, antemedial oblique, medial almost straight, postmedial only a diffuse zone of yellowish and dark grey scales, subterminal sinuous, forming weak W-mark at outer angle of cell. Orbicular and reniform stigmata small, white(ish) without outlines, reniform with plumbeous, lunulate centre; suborbicular patch triangular, fused with orbicular stigma. Terminal line continuous, fine, white, cilia blackish grey, finely spotted with white. Hindwing dark brownish grey with intense ochreous-bronze sheen, discal spot and transverse line obsolete; cilia dark grey with whitish base and a few paler spots at tip. Underside of wings shining ochreous-whitish, irrorated with grey, traces of whitish markings of forewing, transverse lines and discal spots of hindwing present. Female. As male, forewing slightly shorter, broader, hindwing somewhat darker; antenna filiform.

Male genitalia (Fig. 22): uncus very short, flattened, tegumen medium-high, wide, penicular lobes long, narrow. Fultura inferior large, rounded subdeltoidal, with long, flattened, medially granulosely sclerotized apical process; vinculum strong, short, V-shaped. Valvae symmetrical, long, evenly tapering distally, costa heavily sclerotized towards cucullus. Subapical costal process very long, strong, acute, apically slightly arcuate, basal third finely cristate. Cucullus short, triangular with apex pointed; corona absent. Sacculus short, rounded, clavus a setose surface, harpe reduced to its narrow basal bar, pulvillus long, narrow, densely setose. Aedeagus long, thick, straight, carina with long, strongly sclerotized, ribbed dorsal plate and weaker, shorter ventral lamina. Vesica



Figs 23–28. Genitalia figures. 23 = *Nyctycia albivariegata* sp. n., paratype, female; 24 = *N. niveifera* sp. n., holotype; 25–27 = *Potnyctycia frontieri* sp. n., 25 = holotype, 26–27 = paratypes; 28 = *Meganyctycia fansipana* sp. n., paratype, male

membranous, everted ventrally, inflated, spacious, basal part with large, globular dorso-lateral diverticulum, main tube finely scobinate, medial zone armed with short row of sclerotized globuli and cornuti, their size increasing towards distal part of vesica.

Female genitalia (Fig. 23): ovipositor medium-long, conical, apophyses short, fine. Ostium bursae large, sclerotized, trapezoidal with arcuate anterior and posterior edges. Ductus bursae short, folded at middle, inner surfaces with heavily sclerotized, cristate plate; distal half tubular, membranous, proximal half considerably broader, scobinate and wrinkled. Cervix bursae rounded conical, strongly ribbed, ventral surface with somewhat stronger sclerotization, especially at its basal part. Corpus bursae elliptical, weakly membranous, with fine wrinkles and with four broad, long, ribbon-like signa.

Bionomics and distribution. The three known species of the species group are restricted to the northern mountainous regions of Indochina (Thailand, Burma, Vietnam). The imagines are probably on wing during the whole winter. The specimens of *N. albivariiegata* were collected at the very end of November–beginning of December in 1997, and, however, most of them were not completely fresh but are not really worn.

***Nyctycia niveifera* sp. n.**

(Figs 24, 121)

Holotype: female, "THAILAND, Changwat Nan, 25 km N of Bo Luang, 1150 m, 28.II.1998, leg. Márton Hreblay & Csaba Szabóky", slide No. 10750 (coll. HREBLAY, Érd).

Diagnosis. The detailed comparison of the external and genitalic features of this species and its two closely related species are given in the diagnosis of the preceding species.

Description: wingspan 34 mm, length of forewing 16 mm. Female. Body rather strong, head and thorax velvet black, frons and collar clear milk-white, a few hairs of prothoracic tuft and caudal half of metathoracic tuft also white. Palpi very short, porrect, black with white tip, antenna filiform. Abdomen black with milky ochreous lateral patches. Forewing relatively broad, with apex pointed, ground colour velvet black, inner half of wing with large, bright silky white patches, outer half or marginal area with large, more ochreous-whitish zone, costal, basal and medial areas suffused strongly with plumbeous. Ante- and postmedial crosslines absent, their positions marked by sharp edges of differently colours of wing; subterminal absent. Orbicular stigma small, white, reniform plumbeous with a few bronze-ochreous scales; suborbicular patch triangular, fused with orbicular stigma. Marginal area with two sharp black and two diffuse plumbeous patches at termen and at tornus; terminal line interrupted, very fine, blackish grey, cilia ochreous white, spotted with dark plumbeous. Hindwing dark, shining blackish grey with paler inner half, veins dark, discal spot and transverse line diffuse but present; cilia dark blackish grey with whitish base and a few paler spots at inner angle. Underside of wings shining ochreous-whitish, forewing strongly suffused, hindwing densely irrorated with blackish, traces of whitish markings of forewing, transverse lines and discal spots of hindwing well-discernible. Male unknown.

Female genitalia (Fig. 24): ovipositor rather short, weak, apophyses relatively strong. Ostium bursae large, flattened, sclerotized, trapezoidal with arcuate lateral edges. Ductus bursae short, flattened, pear-shaped, sclerotized-scobinate, anterior part folded-cristate. Cervix bursae large, long, apical part rounded conical, partly sclerotized, medial part wrinkled-scobinate with some

stronger ribs and fine crests, proximal third wrinkled, with fine scobination and small but strong, rounded, sclerotized-gelatinous lateral pocket. Corpus bursae elliptical, weakly membranous with fine wrinkles and with four broad, long, ribbon-like signa.

Bionomics and distribution. The only known specimen of this species was collected at a relatively low altitude at the end of the winter period.

***Potnyctycia frontieri* sp. n.**

(Figs 25–27, 122)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest). Slide No. RL6056.

Paratypes: 2 males, 2 females, with the same data as the holotype (coll. HNHN, Budapest; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos RL6025 (male), RL6212 (female).

Diagnosis: the new species is an allopatric sibling of *P. cristifera* HREBLAY et RONKAY, 1997, described from Taiwan. These two species form the sister-group of *P. obsoleta* HREBLAY et RONKAY, 1998, known from the southern Himalayas. The external appearances of the two related species are very close but the wing pattern of *P. frontieri* is more indistinct, the suborbicular patch is paler, less conspicuous, the outlines of the orbicular and reniform stigmata are more obsolete, the discal spot of the hindwing is stronger, more rounded.

The male genitalia of the two species are also very similar in type but the costal extension of *P. frontieri* (Figs 25–26) is much larger, situated more distally, being close to broader neck of cucullus, the fultura inferior is higher, more quadrangular, not constricted below apical end, the distal cornuti fields of the vesica are considerably longer, consisting of stronger spinules. In the female genitalia the ostium bursae of *P. frontieri* (Fig. 27) is considerably narrower but longer than that of *P. cristifera*, the ductus bursae is also narrower, longer, the sclerotization of the proximal part is stronger, covering almost all parts of the ductus.

Description: wingspan 35–38 mm, length of forewing 17–18 mm. Male. Head and thorax dark ochreous brown or pale rufous brown, mixed with dark brown and ochreous, frons, collar, tegulae and thoracic tufts marked with blackish brown. Palpi slender, third joint porrect, antenna shortly ciliate. Abdomen a little more reddish-brown, lateral ridges and dorsal crest well-developed. Forewing elongate, rather narrow, with apex pointed, outer margin finely crenulate. Ground colour dark ochreous brown or pale rufous brown, irrorated with a few darker pinkish brown, ochreous and blackish scales. Wing pattern rather indistinct, subbasal, ante- and postmedial crosslines represented by fine, partly double, sinuous, dark brown lines defined with ground colour, some parts of these crosslines may be obsolete or reduced. Streak of submedian fold short, weak, blackish-brown, inner margin with darker brown stripe at basal third. Orbicular stigma large, flattened, incompletely encircled with ochreous and brownish spots and lines, its filling slightly paler than ground colour. Reniform narrow, encircled with darker brown and whitish, outer side with fine, in-

interrupted whitish streak, filling darker greyish-brown. Claviform a short, blackish arch, suborbicular patch pale, defined by dark brown arch, fused with tip of claviform. Subterminal line interrupted, ochreous, consisting of a row of fine arrowheads, defined by some greyish and brown spots and patches, outer part of marginal area somewhat darkened, with short, dark brownish streaks on and between veins. Hindwing shining ochreous, with reddish-brownish scales, veins and marginal area irrorated with dark brown, discal spot and transverse line relatively strong. Terminal line dark brown, cilia ochreous with red-brown inner line. Underside of wings ochreous with some reddish shade, variably strongly irrorated with dark brown, transverse lines and discal spots present on both wings, latter with whitish centre on forewing; hindwing with fine black streak in median fold.

Female. Similar to male, slightly smaller in size, antenna filiform with thinner axis, hindwing paler with less intense dark brownish irroration.

Male genitalia (Figs 25–26): uncus rather short but strong, curved, tegumen medium-high, wide, penicular lobes narrow, densely setose. Fultura inferior relatively small, pentagonal, vinculum very short, strong. Valva narrow, elongate, costa sclerotized, with a rounded triangular, wide lobe nearby cucullus. Cucullus relatively small, more or less quadratic with rounded angles, covered by sparse rows of strong setae. Sacculus short, clavus a rather small, more or less rounded lobe, harpe reduced to its narrow basal bar, running at middle of valval lamina, its apical extension fused with costal plate. Aedeagus short, tubular, arcuate, dorsal and lateral surfaces of carina covered with fine spiculi, ventral plate continuing in fine, narrow, sclerotized bar. Vesica tubular, membranous, everted forward, medially upturned, partly recurved dorsally. Basal third hyaline, narrow, distally slightly dilated, medial third with strong, broad-based, thorn-like cornutus, terminal third scobinate, with two narrow, long cornuti fields consisting of short, fine spinules.

Female genitalia (Fig. 27): ovipositor medium-long, conical, posterior papillae long, pointed, apophyses long, slender. Ostium bursae small, reversed bell-shaped, granulosely sclerotized. Ductus bursae rather short, flattened, caudal third sclerotized, with lateral margins upturned dorsally, proximal two-third membranous with fine wrinkles, lateral edge with large, broad, sclerotized field on left side. Cervix bursae rounded conical, finely wrinkled, corpus bursae elliptical-ovoid, membranous with fine wrinkles, signa absent.

Bionomics and distribution: The species is presumably a characteristic member of the winter fauna, appearing only after a longer cool or even cold period, together with the species of *Rhynchaglaea*, *Owadaglaea* etc. All five specimens collected are completely freshly emerged.

Etymology: the new species is dedicated to the Society for Environmental Exploration, a UK based non-profit making company that provides support to collaborative research projects that operate under the name "Frontier".

***Meganyctycia fansipana* sp. n.**

(Figs 28–29, 123)

Holotype: male, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest).

Paratypes: 4 males, 2 females, with the same data as the holotype; 11 males, 7 females, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6. and 8.XII.1997, leg. L. Peregovits & L. Ronkay" (HNHM, Budapest; BMNH, London, M. HREBLAY, Érd and G. RONKAY, Budapest).

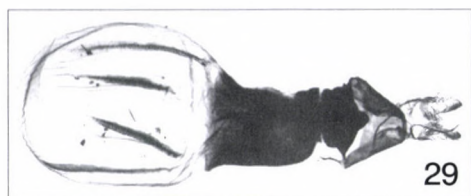
Slide Nos RL6027 (male), RL6213 (female).

Diagnosis: the three known species of the genus *Meganyctycia* HREBLAY et RONKAY, 1998 are rather similar externally, the distinctive features mainly being found in the genitalia. *M. fansipana* differ externally from the related two taxa, *M. armata* HREBLAY et RONKAY, 1998, and *M. forcipata* HREBLAY et RONKAY, 1998 by its darker, more unicolorous forewings with more diffuse crosslines and stigmata. The male genitalia of the new species differ from those of the related species in almost all details, although the ground plan of the genital capsula is very similar. The main differences are: the harpe-costal extension complex and the cucullus are considerably longer, stronger in *M. fansipana* (Fig. 28), the fultura inferior is broader, stronger, the cornutus of the vesica is much weaker, flattened, not thorn-like and the spinules of the cornuti field are much shorter, finer. The female genitalia of *M. fansipana* (Fig. 29) differ from those of the other two congeners by its much larger, longer ostium bursae, wider, calyculate posterior third but weaker, less sclerotized, ribbed anterior two-thirds of ductus bursae and by the more sclerotized, less cristate cervix bursae, respectively.

Description: wingspan 40–45 mm, length of forewing 19–21 mm. Male. Body robust, head and thorax dark chocolate-brown, mixed with ochreous and dark grey; collar and tegulae marked with blackish lines. Palpi rather long, slender, upturned, antenna shortly ciliate. Abdomen long, dark greyish brown, lateral ridges pinkish brown, anal tuft ochreous-brownish; dorsal crest well-developed. Forewing long, rather broad triangular, with apex pointed, outer margin finely crenulate. Ground colour dark chocolate-brown, irrorated with a few ochreous- and reddish-brown, especially in upper parts of medial and marginal areas. Wing pattern rather diffuse, subbasal, ante- and post-medial crosslines double, sinuous, blackish brown filled with pale reddish brown. Medial area strongly constricted below cell, medial line obsolescent. Stigmata present, orbicular oblique, flattened, ochreous-brownish with darker centre, reniform narrow, encircled with ochreous brown, filled with dark grey and whitish-ochreous, claviform rounded, blackish brown, with long, wedge-shaped, black streak at its lower edge. Suborbicular patch small, less conspicuous, red-brownish, often darkened to chocolate-brown. Subterminal line sinuous, ochreous- or reddish brown, defined by a few dark spots on both sides. Terminal line whitish with small dark brown spots, cilia as ground colour, weakly spotted with ochreous-brown. Hindwing suffused strongly with dark greyish brown, inner area slightly paler, discal spot and transverse line diffuse. Underside of wings reddish-ochreous, forewing strongly, hindwing sparsely irrorated with dark brown. Transverse lines and discal spots well-defined on both wings, discal spot of forewing with whitish centre.

Male genitalia (Fig. 28): uncus rather short, broadly lanceolate with apex pointed, tegumen narrow, high, penicular lobes narrow, small. Fultura inferior large, sclerotized, quadratic with rounded apical angles, vallum penis rather strong, large; vinculum very short, strong. Valva very long, slender, strongly sclerotized, proximal part broader, tapering, distal half stick-like, curved. Costa heavily sclerotized, harpe fused with costa forming large horn-like, very long, medially curved process, its apical half almost straight, acute. Cucullus elongate, narrow, bar-like, with apex acute, covered with long bristles. Sacculus long, clavus a finely setose triangular lobe, harpe reduced, pulvillus long, densely setose. Aedeagus long, cylindrical, curved at distal third, carina with two strong lateral plates, one of them shorter, apically strongly serrated, the other longer, smooth. Vesica broadly tubular, bent ventrally, medial part dilated. Basal part wrinkled, with conical diverticulum, medial third armed with strong, long, bar-like, apically pointed lateral cornutus, opposite surface with some stronger, parallel crests, inner (ventral) side with elongate, sclerotized stripe continuing as a cornuti field consisting of short spiculi.

Female genitalia (Fig. 29): ovipositor rather short, conical, gonapophyses slender, fine. Ostium bursae large, quadrangular, its ventral plate larger, stronger, rhomboidal with large, triangular



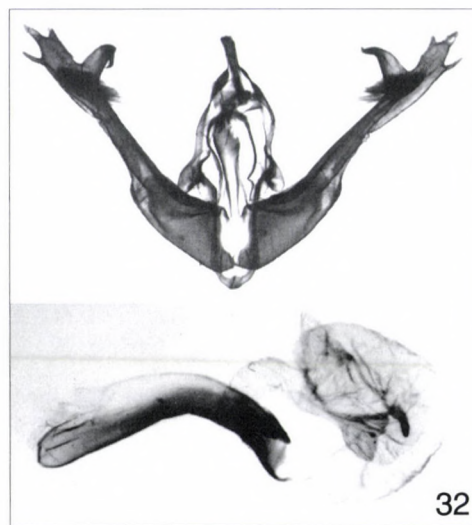
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32



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Figs 29–33. Genitalia figures. 29 = *Meganyctycia fansipana* sp. n., paratype, female; 30–31 = *Iso-lasia pardaria* (MOORE), 30 = female, Nepal; 31 = male, Nepal; 32–33 = *I. caovansungi* sp. n., paratype, males

caudal extension, dorsal plate more or less lyriform, its surface strongly granulose. Ductus bursae broad, flattened, posterior third calyculate, sclerotized and partly folded, anterior two-third membranous-gelatinose, its proximal half strongly ribbed. Cervix bursae rounded conical, smoothly sclerotized, dorso-lateral margin with long wrinkles; corpus bursae large, elliptical-ovoid, with four long signum-stripes.

Bionomics and distribution. The new species was found to be relatively frequent in the higher montane primary forests. The peak of its flight period is probably the late autumn, the majority of the specimens were a bit worn in the first decade of December.

***Isolasia caovansungi* sp. n.**

(Figs 32–34, 124)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest).

Paratypes. Vietnam: 35 males, 14 females, from the same locality, 29.XI., 4–6. and 8.XII.1997 (coll. HNHM, Budapest); 1 female, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. PEREGOVITS & L. RONKAY (colls HNHM, Budapest; BMNH, London, M. HREBLAY, Érd and G. RONKAY, Budapest). Thailand: 1 female, Doi Inthanon, 18°34'N, 98°59'E, GPS, 2300 m, 17. I. 1997, leg. MALICKY (coll. H. HACKER, Staffelstein).

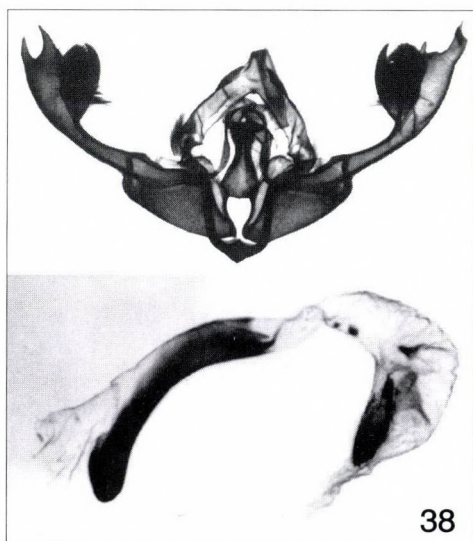
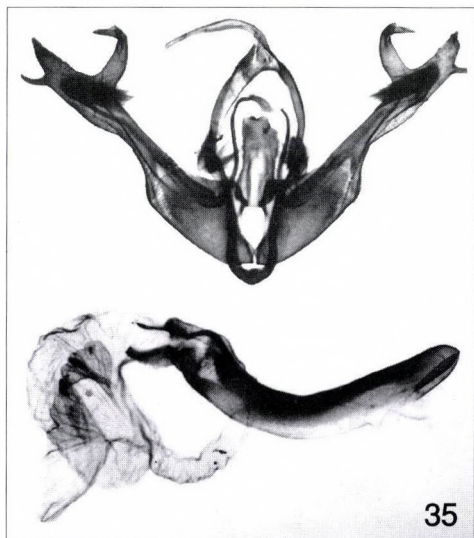
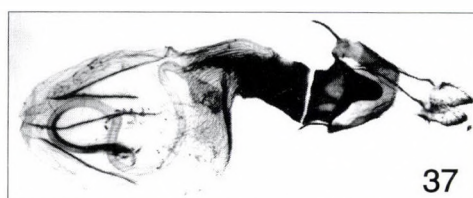
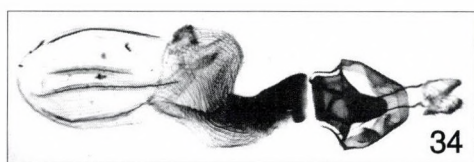
Slide Nos RL6030, RL6066 (males), HACKER 10578, RL6081 (females).

Diagnosis. The genus *Isolasia* WARREN, 1912 contains five species, three of them are described as new here. All three Vietnamese species belong to the *I. pardaria* (MOORE, 1882) species-group, differing externally by the intensity of the paler, regularly ochreous or pale greenish suffusion of basal and marginal areas and the suborbicular patch and the distinctness of the dark markings, especially the two main crosslines. *I. caovansungi* is the darkest species, brown(ish) without greenish or olive suffusion of shade, the paler ochreous suffusion is the weakest, often reduced, the crosslines are rather diffuse, less sinuous. Its close relative, *I. jactordoffi* is somewhat larger in size with broader forewings, ground colour paler brown with fine olive-greenish and pinkish irroration and intense light ochreous-brownish suffusion, especially in marginal area, orbicular and suborbicular stigmata usually clear ochreous. This species has the most distinct and sinuous ante- and postmedial crosslines. *I. jactordoffi* is very close to *I. pardaria*, but the forewing ground colour of the latter is paler brown with intense olive-greenish suffusion, the pale part of the marginal area is more diffuse and the crosslines are more indistinct, less sinuous. The fourth species, *I. dilutissima* most resembles *I. biramata* WARREN, 1912 by its very conspicuous, bright ochreous basal and marginal fields and orbicular and suborbicular stigmata, but the wing shape and the details of the dark pattern clearly show its closer relationships with the members of the *pardaria*-group.

The male genitalia of *I. pardaria*, *I. jacktordoffi* and *I. caovansungi* (Figs 31–33, 35–36) are very similar in type, those of *I. dilutissima* (Fig. 38) differ from other three taxa by their shorter valvae with much more dilated, strongly asymmetrical apical part, smaller, more subdeltoidal fultura inferior and by the narrower, less complex tube of vesica, with the presence of a cornuti field consisting of minute spiculi, this cornuti field is missing in the related taxa. The valvae of the other three species are significantly longer, narrower with less dilated, more or less symmetrical cuculli, and the fultura inferior is broader, more quadrangular. Comparing the three closely related species, *I. caovansungi* has bifurcate valval apex with fine short apical process, rather short, less curved ventral process and strong, wedge-shaped subapical costal extension with finely S-shaped tip. The valval apices of *I. pardaria* and *I. jacktordoffi* are simple, much stronger, broadly triangular with acute tip, the ventral process is somewhat stronger, more curved and the subapical costal extension is longer, narrower at base, its tip straight. The clasping apparatus of *I. jacktordoffi* differs from those of *I. pardaria* by its somewhat shorter, medially broader valva with broader but shorter cucullus, and larger, apically less tapering fultura inferior. The vesica of the three species differ mostly in the size of the cornutus and the crest-like, large postero-lateral diverticulum. The cornutus is the smallest in *I. jacktordoffi*, somewhat larger in *I. caovansungi*, and largest in *I. pardaria*, while the postero-lateral diverticulum is much larger in *I. jacktordoffi* than in the other two taxa.

The female genitalia of *I. pardaria*, *I. jacktordoffi* and *I. caovansungi* (Figs 30, 34, 37) are very similar, those of *I. pardaria* differ from the other two species by its less asymmetrical ostial process. The ostium and ductus bursae of *I. caovansungi* are narrower, the cervix is smaller, more quadrangular than those of *I. jacktordoffi*.

Description: wingspan 35–37 mm, length of forewing 16–18 mm. Male. Head and thorax dark reddish brown mixed with ochreous and olive-brownish, collar and tegulae marked with dark brown. Palpi slender, upturned, antenna very shortly ciliate, pro- and metathoracic tufts large. Abdomen somewhat darker, basal part with ochreous hairs, lateral ridges rufous brown, anal tuft weak, pinkish-ochreous; dorsal crest strong. Forewing long, narrow, with apex pointed, outer margin crenulate. Forewing ground colour shining, dark reddish brown, basal and marginal areas suffused with pale ochreous-brownish. Ante- and postmedial crosslines rather indistinct, double, slightly sinuous, dark brown filled with ochreous, medial area constricted strongly below cell. Orbicular and reniform stigmata large, encircled with blackish and ochreous-whitish, former most often oblique, flattened, latter narrow, elliptical-lunulate. Orbicular filled with ochreous, its centre often darker brown, filling of reniform darker, its lower half usually dark grey; claviform represented by variably long, triangular black(ish) line. Suborbicular patch relatively large, ochreous. Subterminal more or less continuous, rather diffuse, ochreous, sinuate, marked with indistinct pinkish-brownish arrowheads and dark grey patches. Terminal line row of blackish spots, cilia as ground colour, spotted with ochreous. Hindwing almost concolorous dark greyish-brown, veins, transverse line and discal spot slightly darker. Underside of wings greyish-ochreous with some reddish shade, variably strongly irrorated with dark brown, transverse lines and discal spots present on both wings, latter much stronger on hindwing, without whitish centre as on forewing; hindwing with fine black streak in median fold. Female. Similar to male but generally darker in colouration,



Figs 34–38. Genitalia figures. 34 = *Isolasia caovansungi* sp. n., paratype, female; 35–37 = *I. jacktordoffi* sp. n., paratypes; 38 = *I. dilutissima* sp. n., holotype, male

pale ochreous-brownish suffusion less intense or reduced, wings somewhat shorter, abdomen shorter, thicker with strong, dilated last segment.

Male genitalia (Figs 32–33): uncus long, slender, slightly constricted at middle, tegumen high, rather narrow, peniculus lobes small, rounded. Fultura inferior large, strong, high quadrangular with irregular, more or less triangular apical process; vinculum very short, strong, U-shaped. Valva very long, narrow, sclerotized, medial third constricted, left and right cuculli almost symmetrical. Cucullus slightly dilated, sclerotized, flattened, apex bifurcate with fine short apical process, ventro-lateral process rather short, less curved, subapical costal extension strong, wedge-shaped with finely S-shaped tip. Medial part of cucullus with strong, sclerotized crest, covered densely with long bristles. Sacculus medium-long, sclerotized, clavus and harpe reduced. Aedeagus long, cylindrical, curved, carina with shorter dorsal and longer, eversible ventral bars. Vesica long, broadly tubular, recurved dorso-laterally. Basal part narrow, medial and distal parts strongly dilated, inflated, with three membranous diverticula. One of them long, tubular, terminating in short, finely pointed cornutus, medio-lateral one conical, scobinate, postero-lateral larger, flattened-conical, more or less crest-like.

Female genitalia (Fig. 34): ovipositor medium-long, conical, gonapophyses long, slender. Ostium bursae large, quadratic with huge, apically rounded triangular caudal process slightly laterally from axis to right side. Ductus bursae flattened, broadly tubular, mostly heavily sclerotized, connected to cervix bursae by strongly ribbed proximal part. Cervix bursae more or less quadrangular, strongly ribbed, finely scobinate, with short, rounded conical proximo-lateral appendix. Corpus bursae elliptical, wrinkled, with four long signum-stripes.

Bionomics and distribution. The species is a characteristic member of the winter fauna in northern Vietnam, it was found in relatively high numbers at the beginning of December, when all were freshly emerged; another specimen is known from northern Thailand from the middle of January. Most of the specimens were collected at light from dusk to early evening or on sugar baits during the twilight and the first hour of the evening.

The related two sympatric species, *I. jacktordoffi* and *I. dilutissima*, have been observed in the same habitats, their flight and behaviour being similar to those of *I. caovansungi* but appeared to be much rarer during the winter expedition in the first days of December, 1997.

Etymology: the new species is dedicated to Prof. CAO VAN SUNG, mammalogist, former Director General of the Institute of Ecology and Biological Resources, Hanoi.

***Isolasia jacktordoffi* sp. n.**

(Figs 35–37, 125)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest).

Paratypes. Vietnam. 6 males, 3 females, from the same locality, 4–6. and 8.XII.1997; 2 males, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. PEREGOVITS & L. RONKAY. Thailand. 1 male, Prov. Chiang Mai, Mt. Doi Inthanon, NP, 2300 m, 2.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. HNHN, Budapest; BMNH, London, M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos HM11266, RL6029, RL6067 (males), RL6080 (female).

Diagnosis: the comparison of *I. jacktordoffi* with the allied species is given under the diagnosis of the preceding species.

Description: wingspan 36–39 mm, length of forewing 17–19 mm. Male. Head and thorax reddish brown mixed with ochreous and olive-greenish, palpi, frons, collar and tegulae marked with blackish brown and pinkish. Palpi slender, upturned, antenna shortly ciliate, pro- and metathoracic tufts large. Abdomen more brownish, basal part with ochreous hairs, lateral ridges ochreous brown, anal tuft weak, pinkish-ochreous; dorsal crest strong. Forewing long, narrow, with apex pointed, outer margin crenulate. Forewing ground colour shining reddish brown mixed with olive-greenish, basal and marginal areas suffused with pale ochreous-brownish and pale green, irrorated with pinkish. Subbasal, ante- and postmedial crosslines rather sharply defined, double, slightly sinuous, dark brown filled with ochreous, streak of submedial fold short, blackish. Medial line more indistinct, dark brown, medial area constricted strongly below cell. Orbicular and reniform stigmata large, encircled with blackish and ochreous-whitish, former rounded or slightly flattened, latter elliptical-lunulate. Orbicular filled with ochreous, its centre often with a few darker scales, reniform somewhat darker, its lower third usually dark grey. Claviform represented by variably long, triangular or arrowhead-like black mark; suborbicular patch large, ochreous. Subterminal continuous, ochreous, waved, marked with indistinct pinkish-brownish arrowheads and dark grey patches. Terminal line row of blackish triangles, cilia as ground colour, spotted with ochreous. Hindwing almost concolorous dark greyish-brown, veins, transverse line and discal spot present but very indistinct. Underside of wings ochreous with some reddish shade, irrorated with dark brown, transverse lines rather sharply defined on both wings, discal spot of forewing with whitish centre, that of hindwing stronger, dark brown; hindwing with fine black streak in median fold. Female. Similar to male but usually darker in colouration, forewing with somewhat weaker ochreous suffusion, wings somewhat shorter, abdomen shorter, thicker with strong, dilated last segment.

Male genitalia (Figs 35–36): uncus long, slender, tegumen high, narrow, peniclar lobes small, rounded. Fultura inferior large, strong, high quadrangular with irregular, short, more or less triangular apical process; vinculum very short, strong, U-shaped. Valva very long, sclerotized, medial part constricted, cuculli almost symmetrical. Cucullus slightly dilated, sclerotized, apex acute triangular, ventro-lateral process strong, subapical costal extension strong, wedge-shaped with acute, recurved tip. Medial plate of cucullus with strong, sclerotized crest, covered densely with long bristles. Sacculus medium-long, strong, clavus small, rounded triangular, finely setose lobe; harpe reduced. Aedeagus long, cylindrical, curved, carina with eversible dorsal and ventral bars. Vesica long, broadly tubular, recurved dorso-laterally. Basal part narrow, medial and distal parts dilated, inflated, with three membranous diverticula. One of them tubular, terminating in short, fine cornutus, medio-lateral one pocket-like, scobinate, postero-lateral large, flattened-conical, more or less crest-like.

Female genitalia (Fig. 37): ovipositor medium-long, conical, gonapophyses long, slender. Ostium bursae large, trapezoidal, caudal process very large, apically rounded, situated on right side, far from axis. Ductus bursae flattened, broad, tubular, heavily sclerotized, connected to cervix bursae by strongly ribbed proximal part. Cervix bursae discoidal, ribbed and wrinkled, finely scobinate, corpus bursae elliptical-globular, wrinkled, with four long signum-stripes.

Etymology: the new species is dedicated to Mr ANDREW (Jack) TORDOFF, research coordinator of Frontier-Vietnam.

***Isolasia dilutissima* sp. n.**

(Figs 38, 128)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest).

Paratypes: 1 male, 1 female, with the same data as the holotype (coll. HNHN, Budapest and G. RONKAY, Budapest).

Slide No. RL6028 (male).

Diagnosis: the comparison of *I. dilutissima* with the related taxa is given under the diagnosis of *I. caovansungi*.

Description: wingspan 35–36 mm, length of forewing 15–16 mm. Male. Head and thorax dark brown mixed with ochreous, frons, collar and tegulae marked with ochreous and dark brown. Palpi slender, upturned, antenna ciliate, pro- and metathoracic tufts large. Abdomen somewhat darker, more greyish, basal part with ochreous hairs, lateral ridges and anal tuft red-brownish; dorsal crest strong. Forewing relatively broad, with apex pointed, outer margin crenulate. Forewing ground colour dark greyish brown with intense ochreous sheen, basal and marginal areas suffused with bright ochreous. Subbasal, ante- and postmedial crosslines rather indistinct, double, sinuous, dark brown filled with ochreous. Streak of submedian fold reduced, medial line fine, brownish, medial area constricted strongly below cell. Orbicular and reniform stigmata large, incompletely encircled with a few brownish and ochreous scales. Orbicular rounded, bright ochreous with small brownish spot, reniform rather indistinct, elliptical, filled with ochreous, dark brown and grey. Claviform diffuse blackish brown streak, suborbicular patch large, ochreous, fused with orbicular and with inner side of marginal area. Subterminal more or less continuous, less distinct, whitish-ochreous, sinuous, marked with weak, pale brownish arrowheads and dark grey patches. Terminal line interrupted, fine, dark brown, cilia as ground colour, spotted with ochreous. Hindwing almost concolorous dark greyish-brown, transverse line and discal spot diffuse but visible. Underside of wings reddish-ochreous, irrorated with dark brown, especially in inner area of forewing. Transverse lines and discal spots sharply defined on both wings, discal spot of forewing with whitish centre, hindwing with a fine black streak in median fold.

Male genitalia (Fig. 38): uncus long, flattened, apically slightly dilated, finely spatulate, tegumen rather high, broad, peniculus lobes small, rounded. Fultura inferior strong, subdeltoidal, apical third finely broadened; vinculum very short, strong, V-shaped. Valva long, sclerotized, saccular part broad, medial part constricted, cuculli large, inflated, asymmetrical, with sclerotized medial crest covered densely with long bristles. Left cucullus with apex acute triangular, lateral process strong, subapical costal extension strong, falcate. Right cucullus with apex small, spine-like, lateral process rather remote, stronger, bifurcate, subapical costal extension strong, falcate. Sacculus broad, medium-long, strong, clavus a rounded triangular, inflated, finely setose lobe; harpe reduced to its basal bar. Aedeagus long, cylindrical, curved, carina with short dorsal and ventral bars. Vesica long, tubular, basal part narrow, with two minute, broad-based cornuti. Medial and distal parts dilated, inflated, with two membranous diverticula. Medio-lateral one small, subconical, tubular, terminating in short, acute, broad-based cornutus, subterminal one larger, conical, scobinate.

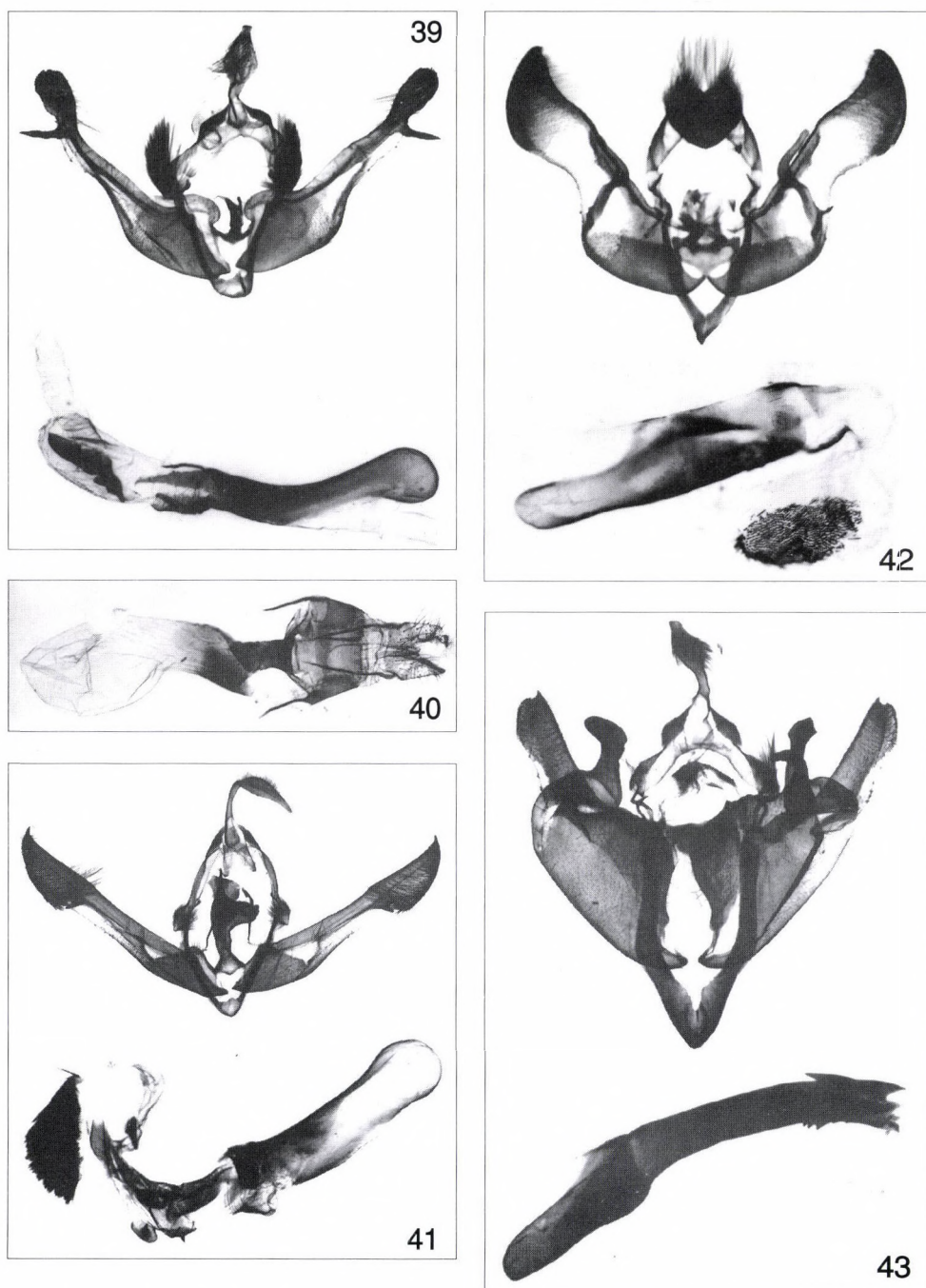
Daseuplexia brevipennata sp. n.

(Figs 39–40, 129–130)

Holotype: male, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest).

Paratypes: 1 female, with the same data as the holotype; 8 males, 2 females, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6. and 8.XII.1997, leg. L. PEREGOVITS & L. RONKAY" (HNHN, Budapest; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos RL6031 (male), RL6206 (female).



Figs 39–43. Genitalia figures. 39–40. *Daseuplexia brevipennata* sp. n., paratypes; 41 = *D. porphyrea* gen. et sp. n., holotype; 42 = *Paranyctycia miraculosa* sp. n., holotype; 43 = *Agrochola kosagezai* sp. n., holotype

Diagnosis: *D. brevipennata* is very similar externally to *D. lageniformis* (HAMPSON, 1894), but the pectination of the male antenna is considerably shorter, representing a transitional stage between *D. lagenifera* (MOORE, 1882) and the *D. lageniformis*-*D. marmorata* species pair. The male genitalia are highly uniform within the genus, *D. brevipennata* (Fig. 39) differ from the closely related *D. lageniformis* and *D. marmorata* HREBLAY et RONKAY, 1998 by its much broader, lanceolate uncus, medially more curved, broader valva, its costa not as straight as in the related taxa and the cucullus is almost straight, not curved ventrally. In addition, the fultura is narrower than that of *D. lageniformis*, and the costal extension is more divergent from ventral edge of the cucullus. The armature of the vesica is more complex in *D. marmorata*, with a large spinulose field and the cornuti are also stronger, longer. The main differences in the female genitalia can be found in the shape and size of the ostium and ductus bursae, which are narrower in *D. brevipennata* (Fig. 40): the ventral ostial plate of the new species is more calyculate, the dorsal plate is narrow, short, the ductus bursae is straight, its proximal part is narrower than in *D. lageniformis*, without longer sclerotized extension towards cervix bursae.

Description: wingspan 30–35 mm, length of forewing 14–16 mm. Male. Head and thorax pinkish red-brown mixed with ochreous, dark brown and a few green hairs, tegulae and collar marked with blackish. Palpi slender, upturned, dark brown, antenna bipectinate with long branches, only last apical joints simple; abdomen a bit more greyish, lateral ridge pinkish brown, anal tuft ochreous-brownish, dorsal crest strong. Forewing rather short, broad, with apex pointed, ground colour pinkish red-brown irrorated with a few vivid green scales, medial area darker brown. Costa striolate with dark brown, subbasal, ante- and postmedial lines sharply defined, double, blackish-brown filled with green. Antemedial oblique, almost straight towards anal vein, then angled inwards, postmedial finely waved. Orbicular and reniform stigmata large, flattened and oblique, encircled with blackish and greenish, filled with pinkish brown, their centres usually greyish. Claviform large, rounded, blackish-brown, suborbicular signum large, greenish-white with pinkish scales on veins. Subterminal green, interrupted, diffuse, sinuous, defined with dark grey and brownish scales on both sides. Terminal line fine, consisting of blackish arches, cilia as ground colour, spotted with darker brown. Hindwing ochreous, suffused strongly with dark cupreous brown, transverse line and discal spot present, diffuse, latter large, more or less rounded. Underside of wings reddish-ochreous, irrorated with dark brown, especially in inner area of forewing. Transverse lines and discal spots well-defined on both wings, discal spot of forewing with whitish centre. Female. As male, antenna filiform, forewing more elongate, ground colour significantly darker pinkish brown with violet shade, green markings also more intense.

Male genitalia (Fig. 39): uncus rather short, broad, lanceolate, with apex finely rounded, tegumen moderately high, broad, penicular lobes well-developed, densely setose. Fultura inferior subdeltoidal with low, broad, rounded triangular basal and high, narrow apical plate with strong apical process. Vinculum short, strong, U-shaped. Valvae symmetrical, saccular part broad, distal part narrow, elongate. Cucullus more or less elliptical with apex rounded, covered with strong setae and finer, longer bristles. Sacculus large, clavus large, rounded, setose lobe. Harpe reduced to its long, narrow basal plate, ampulla missing. Costa sclerotized, costal extension very strong, long, wedge-shaped. Aedeagus rather short, cylindrical, arcuate, carina with finely dentate, eversible dorsal and ventro-lateral bars. Vesica everted forward, short, broadly tubular, bearing five strong, thorn-like, broad-based cornuti and a small terminal diverticulum. Abdominal coremata present.

Female genitalia (Fig. 40): ovipositor relatively short, conical, gonapophyses slender, rather short. Ostium bursae rather narrow, short, ventral plate calyculate, narrow, sclerotized, dorsal plate quadratic, its anterior part a granulose, short bar. Ductus bursae straight, flattened, sclerotized, proximal half wrinkled on dorsal surface. Cervix bursae conical, gelatinous with large sclerotized area near ductus bursae, anterior part wrinkled, corpus bursae elongated-saccate, membranous, without signa.

Bionomics and distribution. The species is supposedly a member of the late autumnal aspect, all males collected are rather worn, only the two females are in good condition. *D. brevipennata* appears as the allopatric eastern sibling species of *D. lageniformis*, distributed in Central and Eastern Nepal and in Sikkim; a female specimen of *D. marmorata* was found in northern Vietnam, from the Fansi-pan Mts (coll. H. HACKER, Staffelsstein).

Daseutype gen. n.

Type species: *porphyrea* sp. n.

Diagnosis: the new genus is considered to be a relative of *Daseuplexia* HAMPSON, 1906, sharing some features of the male genitalia but differing from it by the rather dissimilar forewing colouration, the special junction of the carina penis to fultura inferior and the more complex vesica armed with bulbed cornuti, long sclerotized ribs and brush-like cornuti field.

Description: medium-sized species (wingspan 39 mm) with strong, robust body, head and thorax broad, abdomen long, lateral ridges well-developed, anal tuft and dorsal crest large. Palpi slender, upturned, antenna of male ciliate with short, fasciculate cilia. Forewing long, narrow, with apex pointed, outer margin crenulate. Forewing pattern rather indistinct, crosslines diffuse, double, slightly sinuous, stigmata large, incompletely encircled, suborbicular signum subtriangular, fused with orbicular.

Male genitalia (Fig. 41): uncus long, slender, apical half dilated, flattened, lanceolate with apex pointed. Tegumen weak, narrow, rather high, peniculus lobes small, densely setose. Fultura inferior subdeltoidal with heavily sclerotized, large, "dog-head-shaped" apical plate. Carina penis attached firmly to this part of fultura inferior, hardly separable from it (as in some species-groups of *Hadena* OCHSENHEIMER, 1816 the characteristic, lyriiform-cervicoid vallum penis). Vinculum short, strong, V-shaped. Valva elongate, slightly tapering distally, cucullus rather big, rounded triangular with acute apex, corona represented by rows of strong setae and longer, finer bristles. Costa heavily sclerotized, subapical costal extension short but strong, spiniform. Saccus short, more or less triangular, clavus rounded triangular, granulose, finely setose. Harpe reduced to its basal plate, pulvillus short, narrow. Aedeagus rather short, thick, arcuate, carina with strong, rounded, serrated dorso-lateral plate and weaker, bill-like ventral process. Vesica broadly tubular, everted forward, recurved ventro-laterally. Basal third hyaline, with strong, folded, sclerotized ventro-lateral laminae extending towards medial third of vesica, with three short, broad-based, nail-like cornuti connected to these laminae. Medial third with two small, subconical, scobinate diverticula, one of them with strong but short, spine-like cornutus and huge, brush-like cornuti field covered densely with long, fine spinules. Terminal end with two rounded, scobinate diverticula.

Bionomics and distribution: The single specimen, being the only known representative of the monotypical genus, was found in a primary montane forest, at 2000 m a.s.l. Thought to be a member of the winter fauna, the unique type is a freshly emerged specimen and was collected at light late in the night.

Daseutype porphyrea gen. et sp. n.

(Figs 41, 132)

Holotype: male, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HHNM, Budapest). Slide No. RL6055.

Description: wingspan 39 mm, length of forewing 18 mm. Male. Head and thorax deep violet-brown with pinkish shade, collar and tegulae marked finely with blackish brown. Palpi slender, upturned, antenna with short, fasciculate cilia. Abdomen greyish brown, lateral ridges red-brownish, anal tuft large, reddish-brown, dorsal crest strong. Forewing long, narrow, with apex pointed, outer margin crenulate. Forewing ground colour shining, dark violet-brown with porphyreous-red suffusion and metallic bronze sheen, costal area striolate with dark brown, outer part of marginal field a little more greyish. Wing pattern rather indistinct, subbasal, ante- and postmedial crosslines diffuse, double, slightly sinuous, blackish-brown filled with paler greyish brown; postmedial with row of greenish white dots on veins. Medial area constricted below cell, medial line diffuse, dark brown stripe. Orbicular and reniform stigmata large, incompletely encircled with blackish, filled with ground colour, reniform with conspicuous pinkish-reddish streak at outer side. Claviform more or less quadratic, blackish-brown patch, suborbicular signum subtriangular, fused with orbicular. Subterminal indistinct, pinkish grey, sinuous, forming a W-mark at veins m3-cu1. Terminal line represented by distinct, blackish spots, cilia as ground colour, with fine whitish-greyish medial line. Hindwing shining whitish-ochreous, suffused with dark greyish brown, veins, transverse line, discal spot and marginal area darker. Terminal line dark brown, cilia rufous. Underside of wings whitish-ochreous, irrorated with dark brown and pinkish, transverse lines diffuse, dark brown, discal spots present on both wing, that of forewing with whitish centre. Female unknown.

The male genitalia (Fig. 41) are characterized in the description of the genus.

Paranycetia miraculosa sp. n.

(Figs 42, 133)

Holotype: male, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HHNM, Budapest). Slide No. RL6057.

Diagnosis: the new species is an allopatric sibling of *P. orbiculosa* HREBLAY et RONKAY, 1998, known from the southern Himalayas. The two species are very similar externally, *P. miraculosa* differs from its twin species by its more intense orange-rosy suffusion of the reniform, the marginal area and the cilia; the tufts of the dorsal crest are pinkish orange, not whitish. The male genitalia show easily recognizable differences, as the uncus of the new species (Fig. 42) is shorter but broader, more cordiform, the plate of fultura inferior is wider, with shorter apical process, the valva is less elongate, not straight but subapically

slightly curved with shorter constricted medial part, the cucullus is broader, its costal margin much more concave, the apex is less acute, the harpe is somewhat thicker, the bars of carina are weaker, especially the dentate ventral plate, the cornuti field is significantly smaller, weaker, consisting of much shorter, finer spiculi.

Description: wingspan 26 mm, length of forewing 12 mm. Male. Head and thorax dark, reddish chocolate-brown mixed with whitish and pale bluish-grey hairs, especially on meso- and metathorax; collar and tegulae less distinct, metathoracic tuft huge, whitish grey. Palpi short, slender, upturned, antenna filiform with very short cilia; abdomen short, blackish-brown, dorsal crest consisting of small pinkish orange tufts. Forewing elongated-triangular with apex acute, outer margin evenly arcuate. Ground colour dark chocolate- or blackish-brown, irrorated with whitish and pale grey, basal and especially marginal areas with orange-red scales. Basal area broad, subbasal, ante- and postmedial crosslines fine, double, sinuous, blackish defined with metallic whitish grey. Medial area narrow, constricted strongly below cell, suffused with somewhat darker brown. Stigmata present, orbicular large, rounded, encircled with blackish and white, filled with metallic plumbeous-bluish. Reniform large, elliptical, pale pinkish orange, with metallic blue stripe at inner side; claviform small, rounded, blackish. Subterminal pale, interrupted ochreous shadow, marginal area marked with a very large and a few smaller rosy-orange spots. Terminal line deep red-brown, followed by three small black spots; cilia deep reddish orange, spotted with plumbeous. Hindwing unicolorous dark brown, traces of discal spot and transverse line present but hardly visible; cilia whitish with orange-brown inner line. Underside of wings shining ochreous-whitish, suffused strongly with brownish grey and a few pinkish-orange scales, transverse lines present, diffuse, wavy, discal spot of hindwing large, rounded, that of forewing represented by large whitish-orange patch at place of reniform.

Male genitalia (Fig. 42): uncus short, very broad, more or less cordiform, flattened, densely setose. Tegumen low, rather broad, penicular lobes reduced. Fultura inferior wide, low subdeltoidal with short, medially incised apex, vinculum rather long, fine, V-shaped. Valvae symmetrical, relatively short. Saccular part broad, medial part constricted, apical third slightly dilated, curved ventrally. Cucullus high triangular with apex pointed, its costal margin concave. Corona long, consisting of rather short setae, other parts of cucullus densely hairy. Sacculus narrow, long, clavus reduced, harpe medium-long, slender, curved at basal third. Aedeagus short, cylindrical, carina with small, serrated dorsal and larger, dentate ventral plate continuing as narrow, serrated bar extending into basal part of vesica. Vesica short, broadly tubular, membranous, recurved ventro-laterally, distal half with large, elliptical cornuti field, consisting of very short spiculi, longer at marginal parts. Abdominal coremata present but weak, short.

THE AGROCHOLA HÜBNER, [1821] S. L. SPECIES OF THE REGION

The *Agrochola* s. l. complex is represented in the Himalayan-Pacific region only by a few species, forming small, characteristic species-groups, e.g. the *A. flavirena* (MOORE, 1882), the *A. albirena* BOURSIN, 1956, and the *A. semirena* (DRAUDT, 1950) species-groups. The taxonomic interpretation of the members of these groups has often varied. *A. flavirena* was originally described in *Graphiphora* and placed into this generic complex by BOURSIN (1943, as "*Orthosia*"); *A. semirena* was described in *Lasiplexia*; *A. sakabei* (a member of the *semirena*-

group) was originally described as *Agrochola* (SUGI, 1980) but was later, on the basis of the male genitalia, transferred to *Conistra* HÜBNER, [1821] (SUGI & SEINO, 1986); finally, *A. antiqua*, the most recently described species (HACKER, 1992) was originally placed in *Xylena* OCHSENHEIMER, 1816.

Studies of the winter fauna in the Himalayan-Tibetan region and in Indochina, have resulted in the discovery of additional new taxa that are described here and in a subsequent paper, and which provide ground for producing a new grouping of the species within *Agrochola* s. l.

The *flavirena*-group

- *flavirena* (MOORE, 1882) (*Graphiphora*) (Fig. 134)
- *antiqua* (HACKER, 1992) (*Xylena*), **comb. n.**
- *kosagezai* sp. n.
- *pallidilinea* sp. n.

The *albirena*-group

- *albirena albirena* BOURSIN, 1956
- *albirena annamica* ssp. n.
- *albirena chihtuana* (B.S. CHANG, 1991) (*Conistra*)
- *karma* sp. n.

The *semirena*-group

- *semirena* (DRAUDT, 1950) (*Lasiplexia*), **comb. n.** (Fig. 141)
- *sakabei* SUGI, 1980, **comb. n.**
- *plumbitincta* sp. n.

Agrochola antiqua (HACKER, 1992) (*Xylena*), **comb. n.**

Material examined: 1 male, "Thailand, Doi Inthanon, 18°34'N, 98°59'E, GPS, 2500 m, 17.I.1997, leg. Malicky" (coll. H. HACKER, Staffelstein).

Slide No. HM10961 (male).

***Agrochola kosagezai* sp. n.**

(Figs 43, 135)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6040.

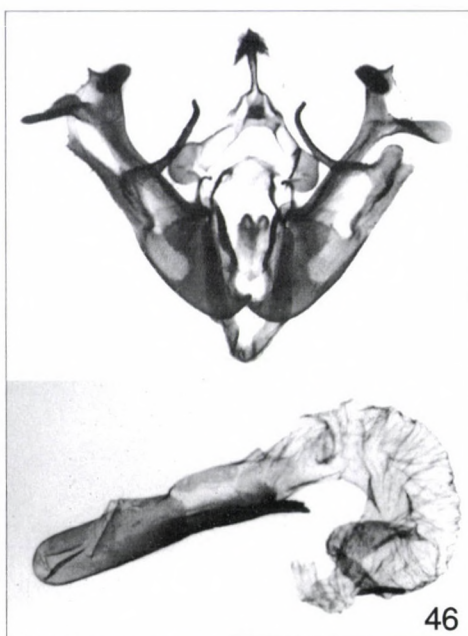
Paratypes: 2 males, from the same locality, dated 4–6.XII. and 8.XII.1997 (coll. HNHM, Budapest and G. RONKAY, Budapest).

Diagnosis: the external appearance of *A. kosagezai* is confusingly similar to that of *A. flavirena*, although its ante- and postmedial crosslines are more sharply defined, and the reniform is broader, more rounded. *A. antiqua* has darker, more unicolorous forewings with more rounded apex, less distinct crosslines. The fourth species of the group, *A. pallidilinea* is rather dissimilar with its pale ochreous-brownish forewings. In addition, the male antenna of this last species is filiform while it is finely bipectinate-ciliate in the other three species.

The male genitalia of *A. kosagezai* are surprisingly different from those of *A. flavirena*, and show much closer relationships with *A. antiqua*. The differences between *A. kosagezai* and *A. antiqua* are as follows: the sacculi of the new species (Fig. 43) are much more asymmetrical than those of *A. antiqua* (see HACKER 1992: 190, fig. c), with well-developed, long distal processi, especially on right side, the dorsal surfaces of sacculi are more convex, less strongly dentate, the harpae are more elongate with significantly larger curved apical parts. The fourth species of this group, *A. pallidilinea* has significantly longer, slender uncus, much smaller, symmetrical sacculi, without dentition or distal processi but with a strongly scobinate, wrinkled clavus, the harpae are significantly longer, narrower, curved, the fultura inferior is only about half as large, more or less cordiform, not quadratic, the aedeagus is shorter, the vesica is much longer, helioid with two strong, bulbed basal cornuti fused partly with carina and a smaller terminal spine. The females of *A. antiqua*, *A. kosagezai* and *A. pallidilinea* are as yet unknown, a female specimen of an *Agrochola* species from E Nepal the genitalia of which (Fig. 44) are different from those of *A. flavirena* may represent the other sex of *A. kosagezai*.

Description: wingspan 37 mm, length of forewing 18 mm. Male. Head and thorax dark claret-brown mixed with violet-greyish, sides of palpi blackish brown, tip of prothoracic crest paler pinkish brown. Antenna with weak, symmetrical pectination consisting of fine branches of cilia. Abdomen darker brown, lateral ridges claret-red, dorsal crest consisting of a few dark brown tufts, anal tuft reddish-ochreous. Forewing long, narrow, with apex acute, outer margin finely concave below apex. Ground colour deep, shining claret-red, basal field and inner half of marginal area irrorated with violaceous grey, outer part of marginal area paler red-brownish, veins covered with dark grey and whitish scales. Ante- and postmedial crosslines double, sinuous, dark brown marked with whitish and ochreous brown, medial line indistinct, narrow, brownish. Orbicular and reniform stigmata present, former more obsolescent, incompletely encircled with brownish, its filling slightly paler than ground colour. Outlines of reniform stigma sharper, whitish-ochreous and dark brown, medial part with variably strong, rounded whitish-ochreous patch, lower third dark greyish; clavi-form absent. Subterminal line diffuse, slightly sinuous, ochreous, defined by a row of red-brownish spots, terminal line fine, waved, reddish-brown, cilia as ground colour. Hindwing concolorous, dark, shining brown-grey, veins and discal spot even darker; cilia deep red-brown with variably strong dark brown inner line. Underside of wings whitish-ochreous, suffused with dark brownish grey and reddish-brown, discal spots and transverse lines present, rather strong. Female unknown.

Male genitalia (Fig. 43): uncus short, dilated at medial third, tegumen low, narrow, penicular lobes small, narrow. Fultura inferior large, quadrangular, sclerotized, vinculum strong, more or less V-shaped. Valvae short, sclerotized, saccular parts strongly asymmetrical. Basal half broad, heavily sclerotized, distal half strongly tapering, with apex acute, terminating in short spine, corona rather



Figs 44–47. Genitalia figures. 44 = *Agrochola* sp. (?*kosagezai*), female, Nepal; 45 = *A. pallidilinea* sp. n., holotype; 46 = *A. albirena* BOURSIN, holotype, China; 47 = *A. albirena annamica* ssp. n., holotype

short, weak. Left sacculus smaller, with short, curved distal process, clavus broad, granulose, finely dentate. Right sacculus larger, more rounded with weaker dentition, but with considerably longer, curved distal process. Harpae slightly asymmetrical, broad-based, longer, narrower on right side, its apical part curved, with apex rounded. Aedeagus long, tubular, dorso-lateral plate of carina heavily sclerotized, with strongly serrated margins, ventro-lateral plate forming narrow, serrate, acute spine directed proximally. Vesica tubular, everted forward, recurved ventro-laterally, membranous with fine scobination, distal third with small, semiglobular diverticulum.

Etymology: the new species is dedicated to Dr. GÉZA KÓSA, of the Botanical Garden of the Institute of Ecology and Botany of the Hungarian Academy of Sciences, the third member of the expedition team in December 1997.

***Agrochola pallidilinea* sp. n.**

(Figs 45, 137)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6038.

Diagnosis: the comparison of the species of the *A. flavirena* species-group is given in the diagnosis of *A. kosagezai*.

Description: wingspan 37 mm, length of forewing 18 mm. Male. Head and thorax dark ochreous grey mixed with brownish, palpi laterally dark brown; antenna filiform. Abdomen darker brown, lateral ridges ochreous, dorsal crest weak, darker brown. Forewing long, narrow, with apex acute, outer margin finely concave below apex. Ground colour shining, pale ochreous sand-brown, irrorated with yellowish-orange, marginal area and inner margin suffused with dark brownish grey. Crosslines present, double, almost straight, dark brown filled with pale ochreous, upper parts of subbasal and antemedial lines obsolescent; medial line indistinct, brownish, shadow-like. Orbicular and reniform stigmata present but diffuse, encircled with ochreous, former more diffuse, filled with pale brownish, latter more sharply defined, filled with grey-brown, lower third even darker greyish; claviform represented by tiny dark grey dot. Subterminal line diffuse, waved, ochreous, defined by a row of indistinct brown spots, terminal line ochreous, cilia as ground colour, spotted finely with brownish. Hindwing concolorous, dark, shining brown-grey, cilia ochreous with strong, dark brown inner line. Underside of wings ochreous, covered strongly dark brownish grey, discal spot and transverse line stronger, well discernible on hindwing, those of forewing hardly visible. Female unknown.

Male genitalia (Fig. 45): uncus long, slender, tegumen low, rather wide, penicular lobes large, rounded. Fultura inferior cordiform plate with short, quadrangular apical part, vinculum strong, more or less U-shaped. Valvae symmetrical, relatively short, sclerotized, elongate, apically tapering, with apex acute, terminating in short spine, corona reduced to a few long bristles. Sacculus long, clavus broad, granulose, wrinkled, densely setose. Harpe strong, rather long, curved, with apex finely pointed. Aedeagus short, thick, cylindrical, dorsal plate of carina with long, broad-based, thorn like cornutus, ventral plate with narrow, acute bar and medium-long, acute, bulbed spine. Vesica long, tubular, helicoid, everted forward, recurved ventro-laterally. Its walls membranous with fine scobination, distal third with large, subconical, scobinate diverticulum and small, broad-based, pointed terminal cornutus.

Agrochola albirena BOURSIN, 1956

(Fig. 46)

Type material examined: holotype male, China, Canton, Kwangtung, slide No. Hö 472 BOURSIN (vesica everted by M. HREBLAY) (MAK, Bonn).

Agrochola albirena annamica ssp. n.

(Figs 47–49, 138)

Holotype: male, "VIETNAM N, Prov. Lao Cai, Sa Pa, 1300 m, 15–20.XI.1993, leg. Bankovics & Csorba", slide No. RL5547 (coll. HNHN, Budapest).

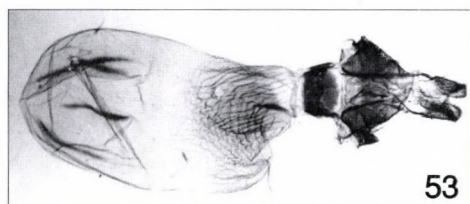
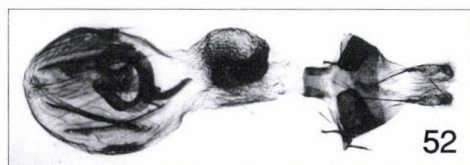
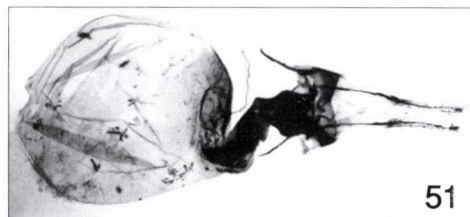
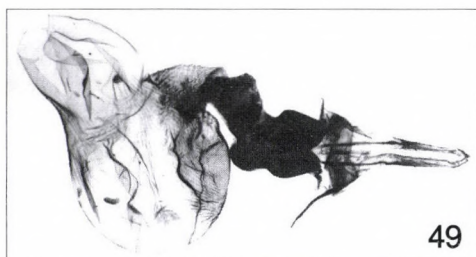
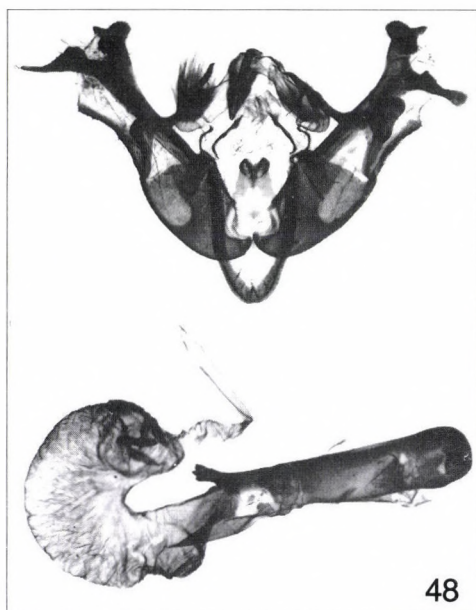
Paratypes. Vietnam. 1 male, 2 females, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. PEREGOVITS & L. RONKAY; 3 males, 5 females, from the same locality, 4–6.XII.1997, leg. L. PEREGOVITS & L. RONKAY. Thailand. Prov. Chiang Mai: 6 males, 2 females, Mt. Doi Inthanon, NP, 2300 m, 11. & 19–20.XI.1998, leg. T. CSÓVÁRI & L. MIKUS; 25 males, 6 females, Mt. Doi Phahompok, 18 km NW of Fang, 2100 m, 7. & 17.XII.1998; 13 males, 4 females, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 8. & 18.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (colls T. CSÓVÁRI, Érd; HNHN, Budapest; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos HM11242, HM11243, HM11254, HM11263, HM11264, HM10901 (males), HM10963 (female).

Diagnosis: the population occurring in northern Vietnam and in northern Thailand differs externally from both the typical *A. a. albirena* population occurring in SE China (vic. of "Canton") and from the Taiwanese *A. a. chihtuana* by its larger size (wingspan 41–44 mm, length of forewing 19–21 mm) and homogeneous, very dark violaceous brown forewing ground colour with reduced crosslines. The male genitalia of the new subspecies (Figs 47–48) differ from those of *A. a. albirena* (Fig. 46) by their more elongate valvae, stronger, thicker harpe, somewhat broader fultura inferior, stronger ventral bar of carina and shorter, finer cornutus of vesica, from *A. a. chihtuana* by its broader valvae, higher, narrower fultura inferior, reduced clavi, stronger basal plates of harpae, stronger cristae on costal extensions, shorter pollexes, longer, narrower dentate ventral bar of carina and more arcuate cornutus of vesica (see Figs 46–48; BOURSIN 1956, HREBLAY et RONKAY 1997). The comparison of *A. albirena* with *A. karma* is given under the latter species.

Description of the genitalia. Male (Figs 47–48): uncus rather short, slender, pointed, tegumen broad, low, penicular lobes large, rounded quadratic, densely setose. Fultura inferior sclerotized, shield-like, rather narrow, with fine apical incision; vinculum strong, U-shaped. Valvae almost symmetrical, elongate, apically slightly dilated, curved. Cucullus reduced to small, elliptical, densely setose plate, apex rounded, pollex short, acute triangular. Sacculus broad, rather short, sclerotized, clavus finely rounded, small, setose lobe. Basal plates of harpae asymmetrical, much larger, stronger on right valva, erected part long, slender, heavily sclerotized, apically acute, finely arcuate. Subapical costal extensions also slightly asymmetrical, apically more flattened, rounded on right valva, its dorsal crest smaller. Aedeagus relatively short, cylindrical, carina with a strong, api-

cally dentate ventro-lateral process. Vesica membranous, broadly tubular, everted forward, re-curved dorsally, producing nearly full circle, distal third with large, conical, scobinate diverticulum and small, slightly arcuate, finely pointed terminal cornutus.



Figs 48–53. Genitalia figures. 48 = *Agrochola albirena annamica* ssp. n., paratypes; 50–51 = *A. karma* sp. n., 50 = paratype, male, 51 = holotype; 52 = *A. plumbitincta* sp. n., paratype, female; 53 = *A. semirena* (DRAUDT), syntype, female, China, West Tien-mu-shan

Female genitalia (Fig. 49): ovipositor relatively long, conical, posterior papillae anales narrow, acute, gonapophyses slender, fine. Ostium bursae sclerotized, large, broad, lyriform, ventral surface with medial crest. Posterior third of ductus bursae sclerotized, quadrangular with sclerotized lateral pocket on left side, medial part flattened, with larger sclerotized plates, anterior third broadened, membranous with strong wrinkles. Cervix bursae large, rounded, partly sclerotized, partly wrinkled, corpus bursae elongated-elliptical, with two small, rounded and two somewhat longer, streak-like signum-patches.

***Agrochola karma* sp. n.**
(Figs 50–51, 139–140)

Holotype: female, "WEST-NEPAL, 20 km N of Dailekh, 3000 m, 20.I.1998, leg. Karma Sherpa", slide No. HM11003 (coll. M. HREBLAY, Érd).

Paratypes. Nepal: 1 male, 4 females, with the same data as the holotype; 1 female, W Nepal, 11 km N of Dailekh, 2350 m, 23.I.1998, leg. K. Sherpa; 1 female, W Nepal, 8 km N of Surkhet, Tal Pokari, 1800 m, 24.I.1998, leg. K. Sherpa (coll. M. HREBLAY, Érd); 2 males, Koshi, Terhathum area, above Gorja, Tshisopani, 2600 m, 87°37'E, 27°21'N, 5.XI.1996, leg. GY. M. LÁSZLÓ and G. RONKAY (coll. P. GYULAI, Miskolc and G. RONKAY, Budapest).

Slide No. HM11002 (male).

Diagnosis. The new species represents the westernmost taxon of the *A. albirena* complex, the differences in the genitalia between *A. karma* and *A. albirena* are significantly larger than between the other geographic subspecies of *A. albirena*, this fact serves the basis for considering the Nepalese taxon as a full species. The new species differs from the continental populations of *A. albirena* by its slightly larger size and the paler, claret-brown ground colour. In the male genitalia, the costal process of *A. karma* (Fig. 50) are bifurcate, the ventral plate of the carina is reduced to a beak-shaped, short process, while the costal process of *A. albirena* are cristate but simple, the ventral plate of the carina is a large, apically dentate, long bar. The female genitalia of the two species differ in the shape and size of the ostium and ductus bursae, the ostium is considerably smaller, narrower in *A. karma* (Fig. 51), the ductus is also narrower, without a larger, pocket-like postero-lateral lobe which is present in *A. albirena* (Fig. 49).

Description: wingspan 42–44 mm, length of forewing 21–22 mm. Sexes similar. Pubescence of head and thorax dark claret-brown, sides of palpi dark brown, antenna of male finely ciliate, that of female filiform. Forewing long, rather broad, with apex acute, upper half of outer margin straight below apex. Ground colour shining, uniform claret-brown, antemedial, medial and postmedial crosslines obsolescent, simple, slightly sinuous, dark brown with weak paler definition, especially of postmedial; medial line an indistinct, brownish shadow except in cell, forming stronger stripe between stigmata. Orbicular poorly visible, rounded, incompletely encircled with pale grey and a few brown scales, filled with ground colour. Reniform stigma large, more or less quadrangular, encircled with whitish-ochreous and a few blackish scales, defined also by diffuse dark patch around lower and outer parts, most parts filled with milky white, a blackish spot at lower third occasionally present; claviform absent or represented by small blackish spot. Subterminal line indistinct, interrupted, whitish-ochreous, defined by a row of blackish spots and stronger black patch at costa, terminal line fine, wavy, brown, cilia as ground colour, with fine whitish line. Hindwing dark greyish

brown, discal spot and transverse line diffuse but visible; cilia reddish mixed with dark brown. Underside of wings ochreous-greyish, forewing covered, hindwing irrorated with dark brownish grey, discal spot and transverse line stronger, well discernible.

Male genitalia (Fig. 50): uncus rather short, slender, pointed, tegumen broad, low, peniculus lobes large, rounded quadratic, densely setose. Fultura inferior sclerotized, shield-like, broad, relatively low, with fine apical incision; vinculum strong, U-shaped. Valvae almost symmetrical, elongate, apically slightly dilated, curved. Cucullus reduced to minute, densely setose plate, apex rounded, pollex fine, acute triangular. Saccus broad, rather short, sclerotized, clavus rounded, large, granulous and setose lobe. Harpae symmetrical, basal plates rounded-arcuate, erected parts long, slender, heavily sclerotized, apically acute, finely arcuate and hooked. Subapical costal extensions bifurcate, asymmetrical, distally more flattened, rounded on right valva, its ventral process longer, cuneate, ventral process on left valva shorter, curved, finely double-peaked. Aedeagus relatively short, cylindrical, carina with strong, beak-shaped ventral process. Vesica membranous with fine scobination, broadly tubular, everted forward, recurved dorsally, producing nearly full circle, distal third with large, semiglobular, scobinate diverticulum and small, straight, finely pointed terminal cornutus.

Female genitalia (Fig. 51): ovipositor relatively long, conical, posterior papillae anales narrow, acute, gonapophyses slender, fine. Ostium bursae sclerotized, large, lyriform, posterior third of ductus bursae sclerotized, more or less triangular with very small lateral angle on left side and a stronger sclerotized fold opposite, medial part flattened, with larger sclerotized plates, anterior third a small, membranous, wrinkled appendage. Cervix bursae rounded, partly sclerotized, partly wrinkled, corpus bursae large, discoidal, membranous, with two small, rounded and two somewhat longer, streak-like signum-patches.

Bionomics and distribution. The new species is a member of the winter fauna, the imagines are on wing from the beginning of November to mid-January, the specimens found at this time are rather fresh. *A. karma* is known from different regions of the Nepal Himalaya, from the western areas to the lower chains of the Kanchenjunga Himal.

Remarks. The specimen illustrated by YOSHIMOTO (1993, p. 132; plate 62, fig. 17) as "*Agrochola albirena*" is also this species! The statement about the genitalia of this "*A. albirena*" being identical with those of *A. chihuana* is erroneous.

Etymology: The new species is dedicated to Mr KARMA SHERPA.

***Agrochola plumbitincta* sp. n.**

(Figs 52, 142)

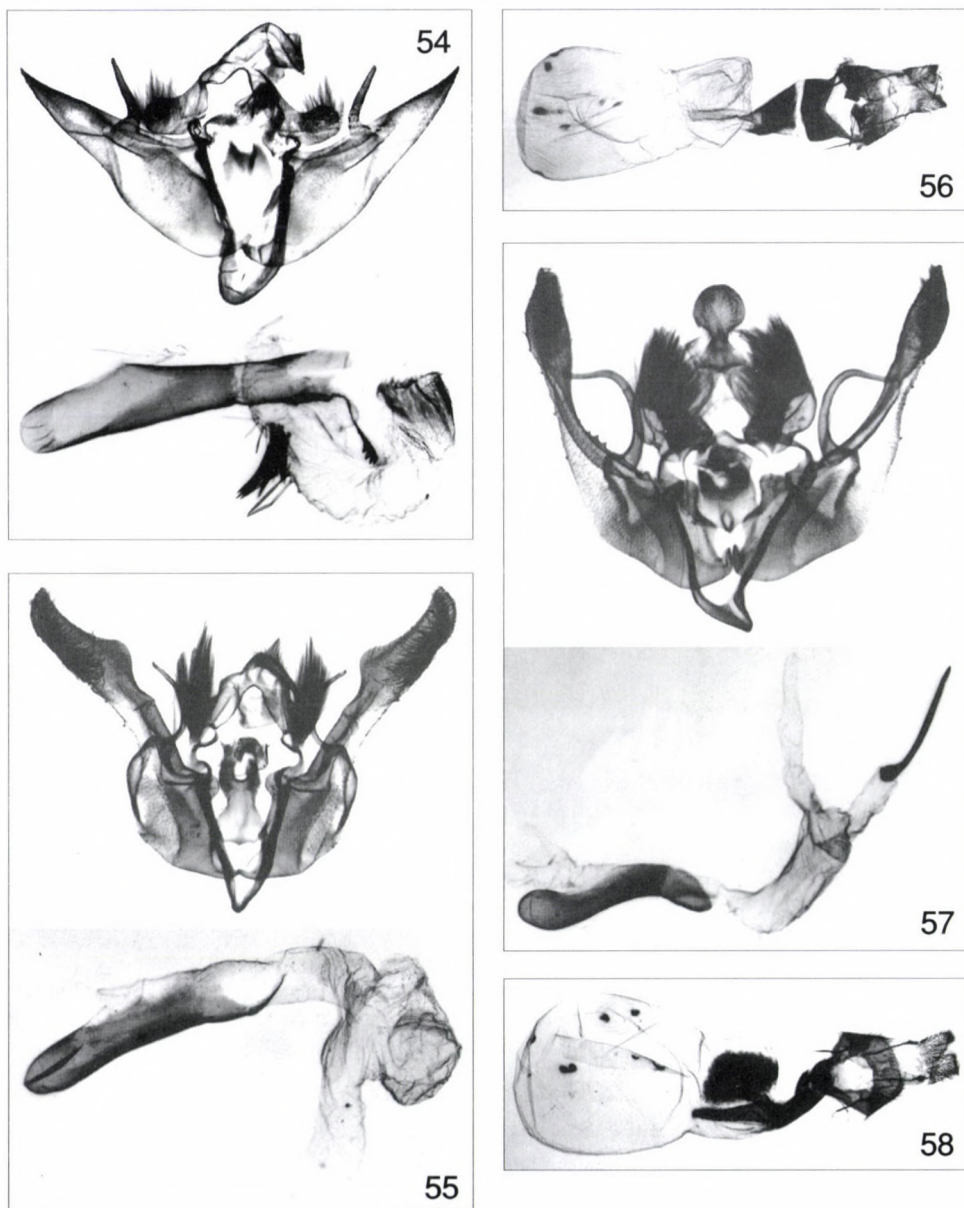
Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest).

Paratype: 2 females, from the same locality, 4–6.XII.1997 (coll. HNHN, Budapest and G. RONKAY, Budapest).

Slide No. RL6047 (female).

Diagnosis: the new species is similar externally to *A. semirena* and to *A. sakabei*. It differs from *A. semirena* by its larger size with broader forewings,

generally darker ground colour, stronger, sharper crosslines, reversed drop-shaped, downwards strongly tapering reniform stigma with much smaller black patch and more concolorous dark grey-brown hindwing, from *A. sakabei* by its



Figs 54–58. Genitalia figures. 54 = *Agrochola sakabei* SUGI, male, Tibet; 55 = *Hemiglaea costalis leptotaenia* ssp. n., paratype, male; 56 = *Hemiglaea ionea* sp. n., holotype; 57–58 = *Rhynchaglaea discoidea* sp. n., 57 = holotype, 58 = paratype, female

more concolorous wings with more sinuous ante- and postmedial crosslines and apically much broader reniform stigma with larger black patch at lower third.

The female genitalia of *A. plumbitincta* (Fig. 52) differ from those of *A. semirena* (Fig. 53) by their smaller, much narrower ostium bursae, somewhat longer ductus bursae, longer, more tubular and curved cervix bursae with stronger ribs apically and smaller, more globular corpus bursae.

Description: wingspan 37–39 mm, length of forewing 18–19 mm. Female. Pubescence of head and thorax dark violaceous brown, frons somewhat paler, more reddish-brown, sides of palpi dark brown, antenna filiform. Abdomen short, paler grey-brown, lateral ridges ochreous-reddish, dorsal crest weak, dark brown. Forewing long, rather broad, with apex pointed, upper half of outer margin straight below apex. Ground colour shining, concolorous, dark violaceous grey-brown, crosslines present, simple, blackish, defined with whitish-ochreous. Upper part of subbasal line, antemedial and postmedial lines sinuous, rather sharply defined, medial line an indistinct, brownish shadow except in cell, forming strong blackish patch between stigmata. Orbicular poorly visible, rounded, incompletely encircled with blackish brown, filled with ground colour. Reniform stigma large, upper part much broader, tapering towards basal vein of cell, encircled with whitish-ochreous and a few blackish scales, most parts filled with milky white, lower third completely black; claviform absent. Subterminal line diffuse, waved, whitish-ochreous, defined by a row of reddish-brown arrowheads, terminal line ochreous, cilia as ground colour, with fine whitish line. Hindwing dark, shining brown-grey, discal spot and transverse line diffuse but fairly visible; cilia reddish mixed with dark brown. Underside of wings covered strongly dark brownish grey, discal spot and transverse line stronger, well discernible on hindwing, those of forewing more diffuse but visible. Male unknown.

Female genitalia (Fig. 52): ovipositor rather short, weak, conical, gonapophyses fine, slender. Ostium bursae sclerotized, small, quadrate, ductus bursae broadly tubular, membranous with finer or stronger wrinkles and sclerotized crests at proximo-lateral part. Cervix bursae elongate, apically curved, with sclerotized wrinkles and crests, corpus bursae elliptical-globular, membranous with fine scobination and four long signum-stripes.

Hemiglaea costalis leptotaenia ssp. n.

(Figs 55, 143)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest).

Paratypes: 1 male, with the same data as the holotype; 1 female, from the same locality, 4–6.XII.1997 1 male, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. PEREGOVITS & L. RONKAY (coll. HNHM, Budapest and G. RONKAY, Budapest); 1 male, Prov. Lao Cai, Sa Pa, Deo Tram Ton, 1750m, 14–15.I.1996, leg. K. HORIE & M. OWADA (NSMT, Tokyo).

Slide No. RL6032 (male).

Diagnosis: the new subspecies differs from the typical populations occurring in the more northern areas of the Pacific zone (Japan, Korea) by its narrower, somewhat darker ochreous-brownish, more sharply edged costal stripe and finer, longer, more sharply defined stigmata, the collar is also darker, more ochreous-brownish with more extensive reddish-brown and blackish irroration,

and the inner area of the hindwing is paler, the discal spot is larger, stronger. The populations in Taiwan are much closer to this race but the specimens are larger in size (Vietnam: wingspan 30–33 mm, length of forewing 14–16 mm, Taiwan: wingspan 32–34 mm, length of forewing 16–16,5 mm) and the ground colour of both wings, especially that of hindwing, is somewhat paler.

The genitalia of the two subspecies of *H. costalis* (BUTLER, 1879) show no significant differences.

Bionomics and distribution. The new subspecies inhabits medium-high and high forested regions in Northern Vietnam, the specimens were found only in the late autumnal period, no overwintering moth is recorded. The imagines were collected at light, mostly in the late evening and around midnight.

***Hemiglaea ionea* sp. n.**

(Figs 56, 144)

Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay", slide No. RL6207 (coll. HNHN, Budapest).

Diagnosis: *H. ionea* is an unmistakable species, being rather different from all known taxa of the genus. It is easily recognizable by its blackish-grey forewings with broad pinkish-rosaceous basal area, the characteristic whitish "*Hemiglaea-stigmata*" and the pinkish irroration in the inner part of the marginal field.

The female genitalia of the new species (Fig. 56) differ from those of *H. himalaya* OWADA, 1993 and *H. longipennis* HREBLAY et RONKAY, 1998 by the broader, proximally not tapering ostium bursae with strongly asymmetrical caudal incision, weaker, anteriorly folded, tapering ductus bursae with much weaker but recognizable, sclerotized, bar-like extension into cervix bursae; from those of *H. costalis* (Butler, 1879) by the larger, caudally much more incised ostium bursae, proximally more tapering ductus bursae with weak, bar-like extension into cervix bursae (this plate is missing in *H. costalis*), larger, more conical cervix bursae and by the different, not ribbon-like signa.

The other three *Hemiglaea* SUGI, 1980 species for which the females are known, *H. horiei* OWADA, 1993, *H. albolineata* OWADA, 1993 and *H. mirabilis* HREBLAY et RONKAY, 1998, have significantly longer ostium and ductus bursae, compared with those of *H. ionea*.

Description: wingspan 35 mm, length of forewing 17 mm. Female. Head and thorax dark rosaceous brown mixed with pinkish and ochreous, tufts of vertex and collar chocolate-brown, Palpi slender, ochreous, antenna filiform. Abdomen dark brown with pinkish-rosaceous lateral hairs, dorsal crest dark brown. Forewing long, narrow, with apex pointed, outer margin crenulate. Ground

colour shining, dark blackish grey with plumbeous sheen, basal area and inner half of marginal field vivid pinkish-rosaceous mixed with a few ochreous scales; apical third of costal margin pale ochreous-brownish. Basal area broad, costal part with characteristic whitish lines, basal dash line, very long, blackish. Medial field narrow, ante- and postmedial crosslines double, dark brown, former arcuate, less sinuous, latter waved, both filled and defined with pinkish; medial line an almost invisible blackish brown shadow. Orbicular and reniform stigmata large, sharply defined, of typical *Hemiglaea* shape, ochreous-whitish filled with blackish grey and whitish. Subterminal rather indistinct, upper half represented by a few tiny ochreous-pinkish dots and their blackish definition, lower half stronger, defined also by pinkish at inner side. Terminal line fine, ochreous, cilia as ground colour. Hindwing almost unicolorous, dark greyish brown, discal spot rather strong, transverse line also visible, shadow-like; cilia pinkish with dark brown-grey inner stripe. Underside of forewing dark brownish grey, that of hindwing bright whitish-ochreous, both wings suffused with pinkish-rosaceous, transverse line and discal spot present on both wings, much stronger on hindwing.

Female genitalia (Fig. 56): ovipositor short, rather weak, apophyses slender, fine. Ostium bursae large, flattened, heavily sclerotized, quadrangular with deep, asymmetrical caudal incision. Ductus bursae short, infundibuliform, laterally folded on right side, strongly, granulosely sclerotized, connected to ostium bursae with wide, membranous neck. Cervix bursae rather small, rounded conical, membranous with fine wrinkles, corpus bursae ovoid, with four interrupted signum-stripes, consisting of 1–3, often remote, rounded signum-patches.

Bionomics and distribution. The unique type is a freshly emerged specimen, collected at the last, coldest night of the expedition in December 1997, when numerous other taxa of the winter fauna were observed first (e.g. *Potnyctycia frontieri*, *Owadaglaea yoshimotoi* HACKER, 1997, *O. reticulata*, *Elwesia macrophthalma*, etc.).

Rhynchaglaea discoidea sp. n.

(Figs 57–58, 145)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6033.

Paratypes. Vietnam. 4 males, 5 females, from the same locality, dated 4–6. and 8.XII.1997; 1 female, Tonkin, Fan-si-pan, 1500 m, 7.III.1995, leg. BRECHLIN. Thailand. Prov. Chiang Mai: 8 males, 2 females, Mt. Doi Inthanon, NP, 2300 m, 11. & 19–20.XI.1998, leg. T. CSÖVÁRI & L. MIKUS; 2., 9. & 14.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (colls HNHM, Budapest; BMNH, London; T. CSÖVÁRI, Érd; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos HM11246, RL6216 (males), HM10940, RL6208 (females).

Diagnosis: the new species is an allopatric sibling of *R. nigromaculata* HREBLAY et RONKAY, 1998, distributed in the Nepalese Himalayas. The external appearance of the two species is very similar but the ground colour of the Vietnamese species is darker, more tobacco-brownish, the dark pattern is stronger, more sharply defined, the whitish outlines of orbicular and reniform stigmata are more conspicuous, the blackish patch between them is smaller, narrower and the brownish suffusion of the hindwing is stronger.

The male genitalia of the two sister species show conspicuous differences, the uncus of *R. discoidea* (Fig. 57) is rounded-discoidal, not elongate as in *R. nigromaculata*, the fultura is stronger, broader, more trapezoidal, with stronger basal process, the valva is much more tapering distally with narrower, more acute cucullus, the costa is dentate at ventral surface, the clavus is significantly larger, the vesica is narrower, tubular, more simple, armed with a huge, thorn-like cornutus on a long, tubular terminal diverticulum.

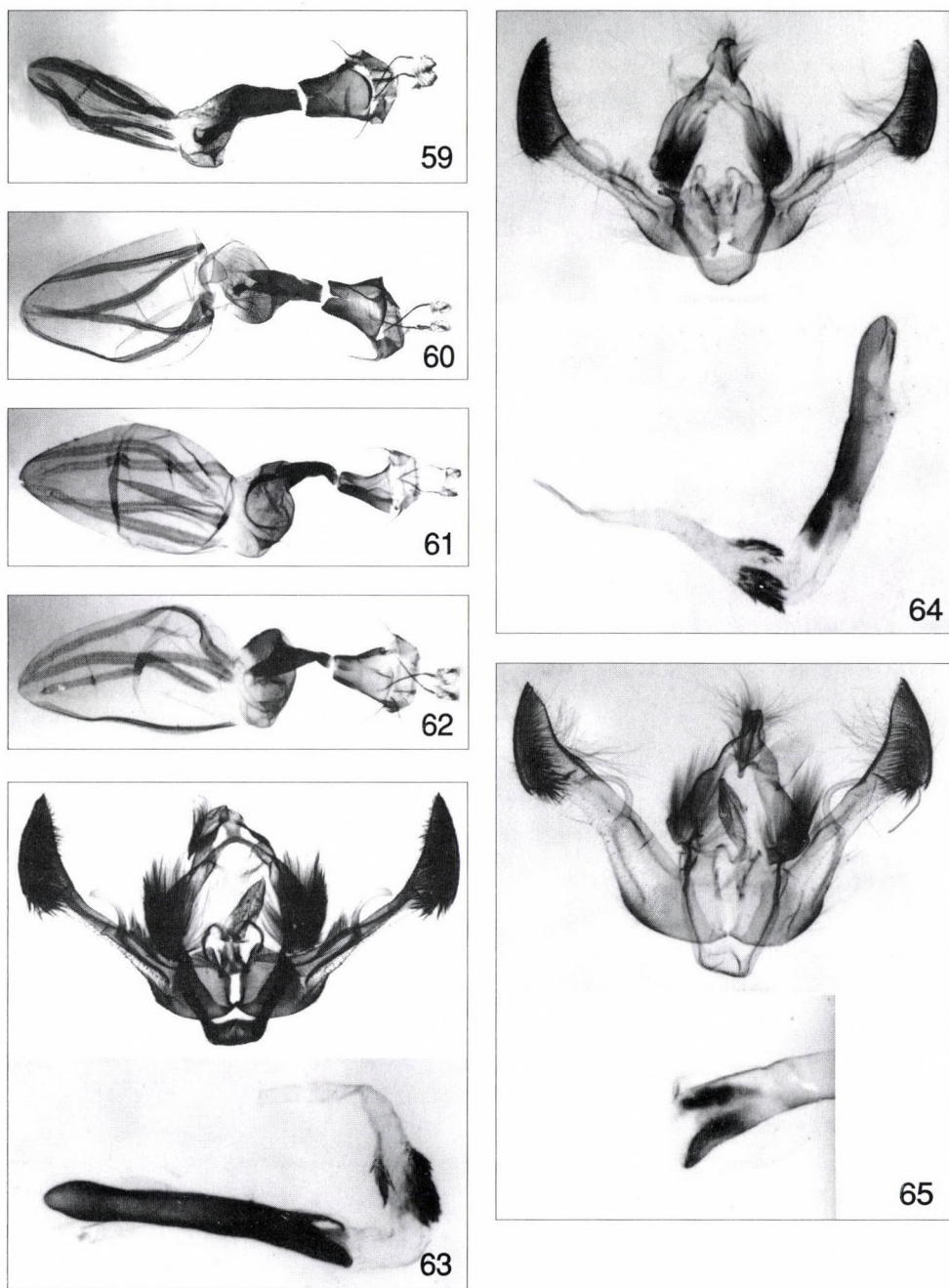
The female genitalia of the two species are even more similar, the ostium bursae of *R. discoidea* (Fig. 58) is somewhat longer, narrower, the sclerotized dorsal plate of the ductus bursae is also longer than in case of *R. nigromaculata*.

Description: wingspan 33–36 mm, length of forewing 15–17 mm. Male. Head and thorax dark red-brown or tobacco-brown, collar with blackish stripe, tegulae marked with blackish. Palpi rosaceous brown, antenna filiform, rather thick, prothoracic tuft large, brown, dorsal crest rather strong, anal tuft ochreous-grey. Forewing narrow, long triangular with apex acute, outer margin crenulate, ground colour shining, dark tobacco-brown with variably strong reddish-brown suffusion. Basal dash long, broad, black, defined by whitish zone above it. Ante- and postmedial cross-lines indistinct, double, represented by a few dark spots, filled with some ochreous; medial line dark grey, shadow-like. Orbicular stigma large, quadrate or rounded, reniform narrow, flattened, both encircled with common, fine whitish-ochreous or pinkish-reddish line, reniform also with reddish outer streak; with rounded, narrow black mark between orbicular and reniform stigmata, clavi-form represented by small blackish spot at its tip. Subterminal obsolescent, sinuous, ochreous, marked with some reddish-brown and a few small dark dots, terminal line fine, sinuous, dark grey, base of cilia ochreous, outer part as ground colour. Hindwing suffused with dark greyish brown, veins and discal spot darker, transverse line present, diffuse. Underside of wings shining ochreous, forewings strongly suffused, hindwing irrorated with dark greyish brown, costal areas covered with rosaceous. Discal spots and transverse lines present on both wings, significantly stronger on hindwing.

Male genitalia (Fig. 57): uncus short, rounded-discoidal, flattened, with small apical process. Tegumen moderately high, broad, peniclar lobes very large, with strong, sclerotized, acute ventro-medial crests. Fultura inferior large, trapezoidal, with rather strong apical incision and small basal process; vinculum short, V-shaped. Valvae symmetrical, elongate, saccular part broad, distal two-third strongly tapering. Costa sclerotized, medial part conspicuously dentate. Cucullus narrow, slightly lanceolate, apex acute with short process; corona long, strong. Sacculus small, clavus large, rounded triangular, harpe long, slender, curved at middle in right angle. Aedeagus short, cylindrical, more or less S-shaped, ventral plate of carina stronger, beak-like. Vesica tubular, everted forward, upturned dorsally, terminal part with two diverticula, one of them short, scobinate, pocket-like, other one long, tubular, armed with very long, thorn-like cornutus.

Female genitalia (Fig. 58): ovipositor short, rather weak, gonapophyses slender, fine. Ostium bursae calyculate, small, rather narrow, both surfaces sclerotized, ventral one stronger, smooth, dorsal one weaker, granulous. Ductus bursae strong, flattened, both surfaces heavily sclerotized, sclerotization extending into cervix bursae, ventral plate shorter, curved, anterior part of dorsal plate straight, cuncate. Cervix bursae semiglobular, dorsal side with large, smoothly sclerotized patch, corpus bursae elliptical-ovoid, with two small, double and three single, rounded signum-patches.

Bionomics and distribution. The species is a typical member of the winter aspect of the Fan-si-pan area, appearing at the beginning of December in the higher montane primary forest region around 2000 m a.s.l.; a specimen from a



Figs 59–65. Genitalia figures. 59–60 = *Owadaglaea reticulata* sp. n., 59 = holotype, 60 = paratype, female; 61 = *O. nigricomma* HREBLAY et RONKAY, female, Nepal; 62 = *O. lucida* HREBLAY et RONKAY, female, Nepal; 63 = *Elwesia macrophthalma* sp. n., holotype; 64 = *E. pallida* WARREN, male, Nepal; 65 = *E. tarka* HREBLAY et RONKAY, paratype, male, Nepal

slightly lower altitude (1600 m) was collected at the beginning of March. A series of the paratypes was collected in northern Thailand in the same vegetation type, at a somewhat higher altitude.

Owadaglaea reticulata sp. n.

(Figs 59–60, 146)

Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest). Slide No. RL6048.

Paratype: 1 female, Vietnam, Prov. Lao Cai, 2050 m, Fan-si-pan Mts, 5 km W Cat Cat, 103°49, 291'E, 22°18,337'N, 15.III.1998, leg. L. PEREGOVITS & T. VÁSÁRHELYI (coll. HNHN, Budapest).

Slide No. RL6175 (female).

Diagnosis: The new species is closely related to *O. nigricomma* HREBLAY et RONKAY, 1998, and *O. lucida* HREBLAY et RONKAY, 1998, these three species forming a well-defined species-group within the genus. *O. reticulata* is closer to *O. lucida* by its external and genital features, the new species has darker forewing colouration with more reticulate scaling, the inner area is strongly variegated with greenish grey and the claviform stigma is larger, more rounded. The female genitalia of the three species differ in the shape of the ostium as its caudal edge is less convex in *O. nigricomma* (Fig. 61) and the sclerotization of the distal part of ductus bursae is much stronger in *O. lucida* (Fig. 62) than those of *O. reticulata* (Figs 59–60).

Description: wingspan 33–35 mm, length of forewing 15–16 mm. Female. Ground colour of head and thorax tobacco-brown with fine greenish shade, collar with strong black stripe, tegulae and metathorax marked with red-brown and a few blackish hairs. Forewing elongate, rather broad, with apex pointed, outer margin finely laced. Ground colour shining tobacco-brown with fine greenish sheen, irrorated with blackish and ochreous, scaling finely reticulate; veins covered with ochreous. Costal area striolate with blackish, basal field variegated strongly with pale greenish white and a few reddish brown scales, subbasal line short, double, blackish. Ante- and postmedial crosslines double, red-brown and blackish filled with ochreous, antemedial arcuate, slightly sinuous, postmedial almost straight, finely S-shaped; medial line sinuous, diffuse, dark brown stripe. Orbicular stigma large, rounded, reniform elliptical, both encircled with ochreous, marked with a few blackish scales and filled with pale rosaceous grey, reniform also with blackish spots. Claviform sharply defined, large, blackish, rounded patch, with sharp, narrow black mark above it between antemedial line and orbicular stigma. Subterminal pale ochreous shadow, defined by indistinct grey-brownish patches, terminal line sharply defined, fine, whitish-ochreous, marked by a row of blackish dots; cilia as ground colour, with fine whitish-greyish inner line. Hindwing almost concolorous dark grey-brown, inner area slightly paler, discal spot a diffuse shadow; cilia dark brown. Underside of wings pale ochreous brown, forewing strongly suffused, hindwing densely irrorated with dark brown, discal spots and double crosslines present on both wings, stronger on hindwing.

Female genitalia (Figs 59–60): ovipositor short, weak, gonapophyses fine, slender. Ostium bursae heavily sclerotized, large, trapezoidal with fine incision at proximal edge, caudal margin

convex. Posterior half of ductus bursae as long as ostium, flattened, broad, caudally tapering. Anterior half fused with cervical part of bursa, dilated, partly sclerotized and ribbed, ductus seminalis originating from a small, conical, ventro-lateral "diverticulum". Corpus bursae elongated-elliptical, with four long signum-stripes.

Bionomics and distribution. The new species, similarly to its congeners, is a characteristic member of the winter fauna.

***Elwesia macrophthalma* sp. n.**

(Figs 63, 147)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46.06'E, 22°20.9'N, 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6046.

Paratype: 1 male, with the same data as the holotype (coll. G. RONKAY, Budapest).

Diagnosis: *Elwesia macrophthalma* is the sister species of *E. pallida* WARREN, 1911. The new species is easily distinguishable from its twin species by its much darker filling of reniform (giving the impression that it has much larger reniform although the outlines of the similarly large stigma is present also on *E. pallida* but only its rounded centre is darker than ground colour!), stronger, more sinuous crosslines, darker hindwing and much longer, reddish-brown prothoracic tuft. The male genitalia of the two species are very similar, *E. macrophthalma* (Fig. 63) has shorter, apically more acute cucullus, somewhat broader fultura inferior and slightly thicker, apically more dilated harpe, as compared with those of *E. pallida* (Fig. 64).

Description: wingspan 30 mm, length of forewing 15 mm. Male. Head and collar light ochreous-grey mixed with a few brown hairs, tuft of vertex high, acute, prothoracic tuft very long, horn-like, dark red-brown. Palpi very long, sides dark chocolate-brown, antenna shortly bipectinate. Abdomen short, somewhat paler than tegulae, dorsal crest strong. Forewing rather long, broad, with apex acute, outer margin strongly crenulate. Ground colour light ochreous grey irrorated with a few red-brown and darker grey scales; inner margin marked with strong red-brown stripe. Subbasal, antemedial, medial and postmedial lines simple, slightly sinuous, oblique, parallel, red-brown with dark brown and grey. Orbicular stigma a tiny red-brown dot, reniform huge, tear-shaped, encircled with dark red-brown, its filling somewhat paler reddish-brown, lower third with large, rounded dark brown-grey circle; claviform a hardly recognizable, cuneate red-brown shadow. Subterminal line rather indistinct, sinuous, pale ochreous defined by a few brownish scales, terminal line very fine, blackish grey, defined by a row of blackish spots between veins; cilia as ground colour mixed with a few darker grey-brown scales. Hindwing suffused with brown, costal area pale ochreous, marginal area and veins darker, discal spot rather strong. Underside of wings shining ochreous, forewing suffused, hindwing irrorated with grey-brown, veins covered with brownish, forewing termen with whitish patches at place of subterminal. Transverse lines and discal spots diffuse but well discernible.

Male genitalia (Fig. 63): uncus short, more or less lanceolate, tegumen medium-high, broad, penicular lobes large, densely setose. Fultura inferior small, triangular, with less sclerotized apical part, vinculum short, thick, quadrangular. Valva elongate, slender, straight, medially strongly con-

stricted. Cucullus large, triangular with apex acute, ventral margin almost straight, ventral surface covered with strong, pointed setae; corona long. Sacculus short, clavus large, rounded triangular, finely setose. Harpe slender, medium-long, curved, apical part slightly dilated, costal extension rather short, spine-like. Aedeagus long, tubular, carina with strong, smooth ventral plate and weaker, shorter dorso-lateral bar. Vesica short, tubular, hyaline, recurved laterally, distal part armed with large dorso-lateral and much weaker ventro-lateral spinulose fields. Abdominal coremata present.

***Elwesia vuquangconi* sp. n.**

(Figs 66, 148)

Holotype: female, "VIETNAM, Prov. Lao Cai, 2540 m, Fan-si-pan Mts, 6 km W Sa Pa, 22°17,814'N, 103°48,657'E, 14.III.1998, leg. L. Peregovits & T. Vászrhelyi" (coll. HNHN, Budapest). Slide No. RL6169.

Paratype. Thailand. 1 male, Prov. Chiang Mai, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 18.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. M. HREBLAY, Érd).

Slide No. HM11256 (male).

Diagnosis: the new species from Vietnam and from Thailand differs externally rather strongly from *E. tarka tarka* HREBLAY et RONKAY, 1998 by its smaller size (wingspan 28 mm, length of forewing 14 mm), stronger crosslines with more intense blackish grey irroration along and between them, sharper stigmata and darker hindwing. The female genitalia of the two species are also very similar, but the ostial plate of *E. vuquangconi* (Fig. 66) is stronger, its proximal part broader, more quadratic, the proximo-lateral crests of ductus bursae are also stronger, extending into basal part of cervix bursae.

Female genitalia (Fig. 66): ovipositor short, rather wide, posterior papillae anales relatively large, strong, apophyses slender. Ostium bursae quadratic-lyriform, flattened, sclerotized, ductus bursae long, tubular, with long, strong crests. Cervix bursae elongated-conical, wrinkled, corpus bursae hyaline, very long, broadly tubular, slightly dilated at fundus.

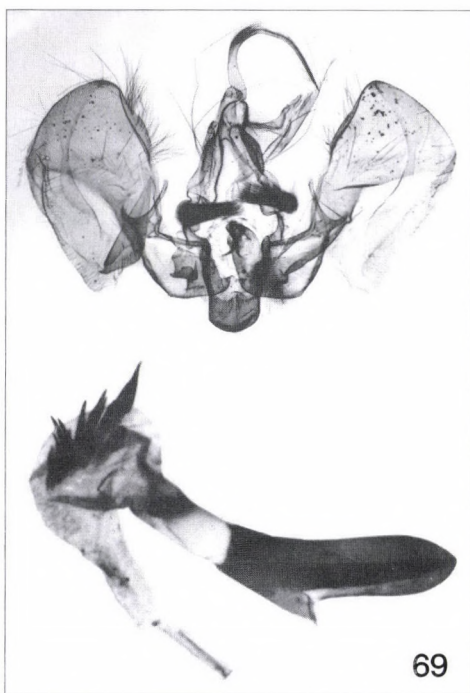
Etymology: the new species is dedicated to Prof. VU QUANG CON, entomologist, Director General of the Institute of Ecology and Biological Resources, Hanoi.

***Elwesia tarka sericea* ssp. n.**

(Figs 67, 149)

Holotype: male, "WEST-NEPAL, 14 km N of Dailekh, 2600 m, 10.XI.1996, leg. Márton Hreblay", slide No. HM9880 (coll. HREBLAY, Érd).

Paratypes. W Nepal. 3 males, 20 km N of Dailekh, 3000 m, 9.XI.1996; 1 female, W Nepal, 11 km N of Dailekh, 2350 m, 11.XI.1996, leg. M. HREBLAY; 1 female, 8 km N of Surkhet, Tal Pokhari, 1800 m, 17.I.1998; 2 males, 11 km N of Dailekh, 2350 m, 23.I.1998, leg. K. SHERPA (coll. M. HREBLAY, Érd).



Figs 66–69. Genitalia figures. 66 = *Elwesia vuquangconi* sp. n., holotype; 67 = *E. tarka sericea* ssp. n., holotype; 68 = *E. diplostigma vasarhelyii* ssp. n., paratype, male; 69 = *Hyalobole subtropica* sp. n., paratype, male

Diagnosis. The population found in W. Nepal differs from the *C. Nepalese* *E. t. tarka* by its concolorous, dark tobacco-brown forewing ground colour, more sharply defined orbicular and reniform stigmata and darker hindwing, from *E. vuquangconi* by its paler, more shining forewing with less intense dark grey irroration in the median area.

***Elwesia diplostigma vasarhelyii* ssp. n.**

(Figs 68, 151)

Holotype: male, "VIETNAM, Prov. Lao Cai, 2540 m, Fan-si-pan Mts, 6 km W Sa Pa, 22°17,814'N, 103°48,657'E, 14.III.1998, leg. L. Peregovits & T. Vászárhelyi" (coll. HNHM, Budapest).

Paratypes: 2 males, with the same data as the holotype (coll. HNHM, Budapest).

Slide No. RL6170 (male).

Diagnosis: the south-easternmost known population of *E. diplostigma* HAMPSON, 1894 differs from the typical ones occurring in the southern Himalayas (C and E Nepal, Sikkim) by its generally darker brownish forewings with stronger dark grey-brownish irroration in basal and medial areas, more oblique antemedial line and by stronger brownish covering of the hindwing. The male genitalia of the two races show no mentionable differences, those of the new subspecies are illustrated in Fig. 68.

Etymology: the new species is dedicated to Dr. TAMÁS VÁSÁRHELYI, heteropterist, Deputy Director General of the Hungarian Natural History Museum, Budapest, member of the expedition to Vietnam in March, 1998.

***Hyalobole subtropica* sp. n.**

(Figs 69–70, 152–153)

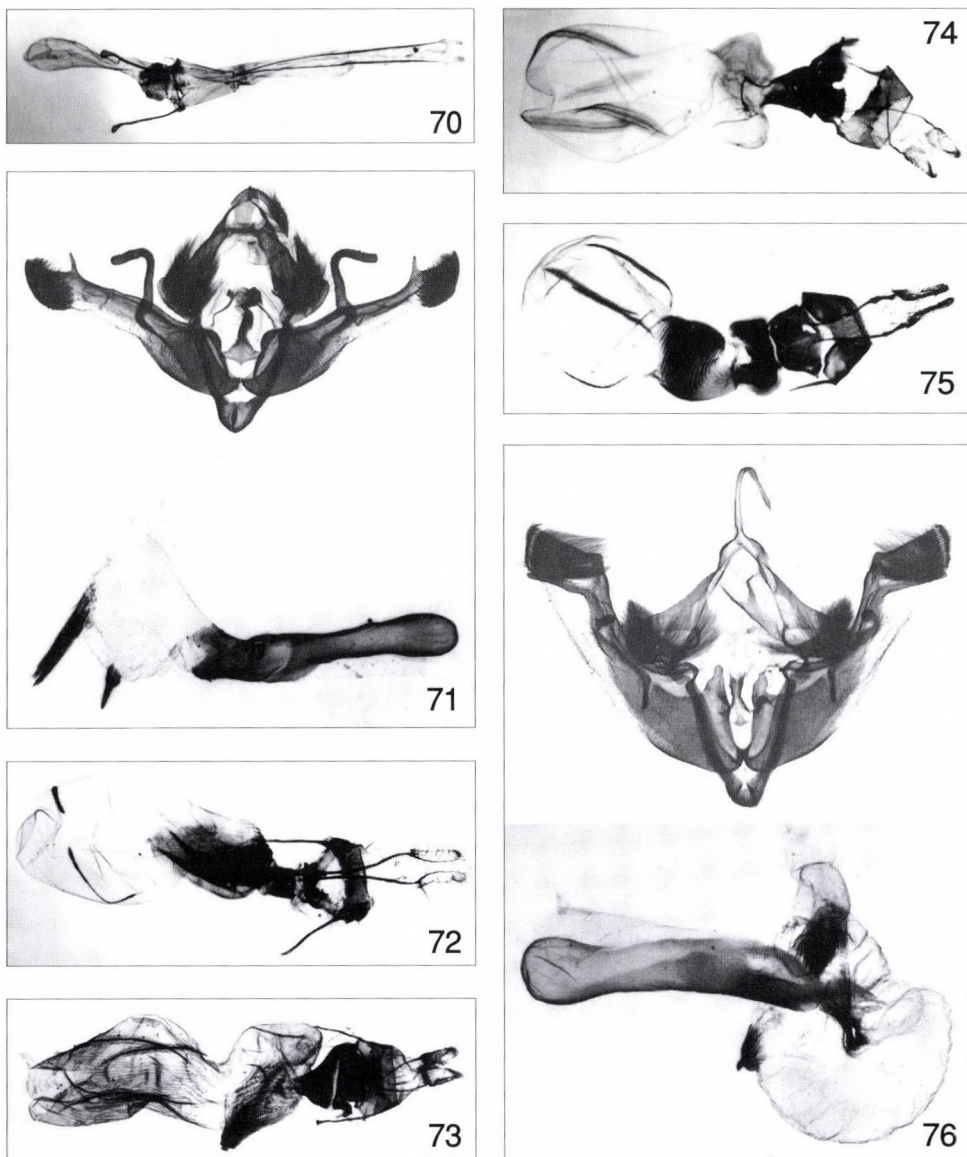
Holotype: male, "THAILAND, Changwat Chiang Mai, Mt. Doi Inthanon, NP, 2300 m, 14.XII.1998, leg. M. Hreblay, Y. Sherpa & I. Soós", slide No. HM11276 (coll. M. HREBLAY, Érd).

Paratypes. Thailand. Prov. Chiang Mai: 1 male, 5 females, Mt. Doi Phahompok, 18 km NW of Fang, 2100 m, 25.II.1998; 10 females, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 15.II. and 24.II.1998, leg. M. HREBLAY & Cs. SZABÓKY (coll. M. HREBLAY, Érd & J. PLANTE, Martigny); 1 male, Mt. Doi Inthanon, NP, 2300 m, 9.XII.1998; 1 male, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 18.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. SOÓS (coll. M. HREBLAY, Érd).

Slide Nos HM11735 (male), HM10711, HM10721 (females).

Diagnosis. The new species resembles externally to dark specimens of *H. nigripalpis* (WARREN, 1911) or *H. infenestra* HREBLAY et RONKAY, 1998 by its rather small size and darkened, only slightly transparent hindwing cell, but the ground colour of the hindwing is even darker, its shape is more or less triangular

with less rounded outer margin than in case of the related species and the genitalia of both sexes, especially the male, show conspicuous differences when compared with the other taxa of the genus. The male genitalia of the new species



Figs 70–76. Genitalia figures. 70 = *Hyalobole subtropica* sp. n., paratype, female; 71–72 = *Xanthia glaucozona* sp. n., 71 = paratype, male, 72 = holotype, female; 73 = *Csorbatype uniformis* (HREBLAY et RONKAY), paratype, female; 74 = *C. csorbai* (HREBLAY et RONKAY), female, Thailand; 75 = *Mniotype chlorobesa* sp. n., holotype; 76 = *M. mucronata* (MOORE), male, Nepal

(Fig. 69) have a huge distal, membranous lobe on the valva, the corona is almost fully reduced, the harpe is bifid with very long, straight inner arm and short, spine-like outer process, the costal extension is absent, the vesica is short, globular-discoïdal, features that are unique within the genus *Hyalobole* WARREN, 1911. In the female genitalia the ductus bursae is reduced, very short, the cervix bursae is rather strong, sclerotized-gelatinous, rounded-discoïdal (Fig. 70).

Description: wingspan 30–31 mm, length of forewing 14–14.5 mm. Male. Head and thorax dark ochreous brown mixed with dark grey and whitish, tips of palpi and vertex paler, whitish-ochreous, antenna of male shortly bipectinate; abdomen dark blackish-greyish. Forewing narrow, with apex pointed, ground colour dark ochreous brown mixed with reddish-brown, darker grey and ochreous, veins covered with greyish. Crosslines rather indistinct, subbasal, ante- and postmedial lines less sinuous, double, darker grey-brown filled with ochreous brown, medial line poorly visible. Orbicular and reniform stigmata encircled with ochreous filled with brownish, latter with stronger dark grey spot at lower half. Subterminal obsolescent, ochreous, waved, terminal line a row of dark spots, cilia as ground colour, striolate with ochreous. Hindwing small, more or less triangular with acute apex and rather straight outer margin, concolorous, dark greyish brown, cell similarly dark; discal spot and transverse line hardly visible. Underside of wings whitish-ochreous, with stronger dark brown and ochreous-brownish irroration, discal spots and transverse lines diffuse but present, well-discernible. Female. As male, but colouration of wings slightly darker, antenna filiform.

Male genitalia (Fig. 69): uncus long, slender, curved, acute; tegumen high, narrow, with sclerotized ventral bars running to high base of uncus, ventral surface with long coremata, penicular lobes small, rounded, densely hairy. Fultura inferior subdeltoidal, apical process dilated, rounded, with fine medial crest, vinculum short, strong, U-shaped. Valvae rather short, constricted at middle, strongly dilated distally, cucullus large, broad, rounded triangular, corona reduced. Ventral lamina of valva forming huge, rather weak, sparsely setose distal lobe extending far over ventral margin, its proximal extremity wrinkled, rounded, lobate. Sacculus short, clavus small, wrinkled-setose prominence. Harpe bifurcate with long, slender inner and much shorter, curved outer arm, basal plate of harpe long, sclerotized; ampulla missing. Aedeagus short, narrow, arcuate, carina with acute, basally finely dentate ventro-lateral extension. Vesica hyaline, short, basal part globular, with two rows of rather strong spinules; distal part tubular, recurved dorsally.

Female genitalia (Fig. 70): ovipositor and gonapophyses very long, ostium bursae broadly cup-shaped, relatively weak with fine scobination. Ductus bursae very short, membranous, cervix bursae discoïdal, sclerotized-gelatinous, corpus bursae hyaline, elongate, fundus dilated, rounded.

Bionomics and distribution. A species of the late winter-early spring period, the males appear probably much earlier than the females, only the few males collected at the beginning of December were fresh while the larger series of the females collected at the early spring aspect are usually in much better condition.

***Xanthia glaucozona* sp. n.**
(Figs 71–72, 154)

Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest). Slide No. RL6209.

Paratypes. Vietnam. 2 males, 1 female, with the same data as the holotype. Thailand. 1 female, Prov. Chiang Mai, 2 m, Mt. Doi Inthanon, NP, 2300 m, 2.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. Soós (coll. HNHM, Budapest; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide No. RL6042 (male), HM11269 (female).

Diagnosis: The new species is closely related to *X. aculeata* HREBLAY et RONKAY, 1998 and *X. tatachana* B. S. CHANG, 1991, being closer to the former. *X. glaucozona* differs from this Nepalese sister species by its more distinct crosslines with much stronger bluish-whitish definition, especially along the postmedial line. The male genitalia of the new species (Fig. 71) differ from those of *X. aculeata* by its smaller, less acute cucullus with shorter but thicker costal process, and by the presence of a large cornuti field in the vesica, consisting of very long, fine spines, this cornuti field is absent in *X. aculeata*. The other related species, *X. tatachana* has much longer, finer harpe, somewhat longer costal extension, broader basal plate of fultura inferior, stronger subbasal cornutus and smaller cornuti field in the vesica. The female genitalia of *X. glaucozona* (Fig. 72), compared with those of *X. tatachana*, have somewhat longer ostium bursae, shorter, broader, posteriorly more sclerotized ductus bursae and considerably larger, longer cervix bursae. They differ from those of *X. aculeata* by their significantly smaller, weaker, not lyriform ostium bursae, shorter ductus bursae and longer, larger cervix bursae.

Description: wingspan 30–34 mm, length of forewing 14–16 mm. Male. Head and thorax dark reddish orange, abdomen more brownish; antenna shortly bipectinate. Forewing long, narrow triangular with apex acute, ground colour deep reddish orange, irrorated with yellowish and dark red-brown, costa and inner margin finely dark brown, veins also darker. Crosslines and stigmata diffuse or obsolescent, sinuous, darker brown, defined by bluish-whitish scales, especially at outer side of postmedial line. Stigmata less distinct, large, incompletely encircled with red-brown, filled with yellowish-orange. Hindwing ochreous with pinkish sheen, irrorated with orange-brown, veins, small discal spot, transverse line and diffuse marginal area darker reddish-brown. Underside of wings shining milky ochreous with fine pinkish-orange shade, irrorated with reddish orange, especially along costal parts and on veins, discal spots and transverse lines diffuse, pale brownish.

Male genitalia (Fig. 71): uncus short, slender, flattened, tegumen broad, peniclar lobes large, rounded triangular. Fultura inferior subdeltoidal with rather small basal plate and long, narrow, sclerotized apical process with acute, dentate tip; vinculum short, strong, V-shaped. Valva narrow, elongate, distally tapering, apically dilated, cucullus more or less quadrangular with apex pointed. Costa with strong but short, straight subapical process; corona long. Saccus rather short, clavus large, rounded triangular, granulose lobe, harpe long, relatively strong, slender, curved in right angle at apical third. Aedeagus short, cylindrical, carina with strong, dentate lateral plate. Vesica short, more or less globular, inflated, distally tapering, bent ventro-laterally. Subbasal cornutus short, acute, bulbed, medial part with cornuti field consisting of very long, fine, pin-like spines.

Female genitalia (Fig. 72) ovipositor rather long, weak, conical, posterior papillae anales long, narrow, pointed, gonapophyses long, slender. Ventral ring of ostium bursae membranous, dorsal plate small, trapezoidal, sclerotized, covered with fine teeth, sternite VIII with two heavily sclerotized, strongly dentate lobes attached firmly to ventral side of ostium bursae. Ductus bursae very short, tubular, flattened, proximal part membranous with fine scobination and a few dorsal ribs, distal part sclerotized, its margins stronger, slightly upturned. Cervix bursae large, rounded

quadratic, partly sclerotized and ribbed on both surfaces, corpus bursae elliptical, hyaline, with a long and a considerably shorter, fine, signum-stripe.

Csorbatype gen. n.

Type species: "*Mniotype*" *csorbai* HREBLAY et RONKAY, 1998

Members of the genus:

C. informis (HREBLAY et RONKAY, 1998)

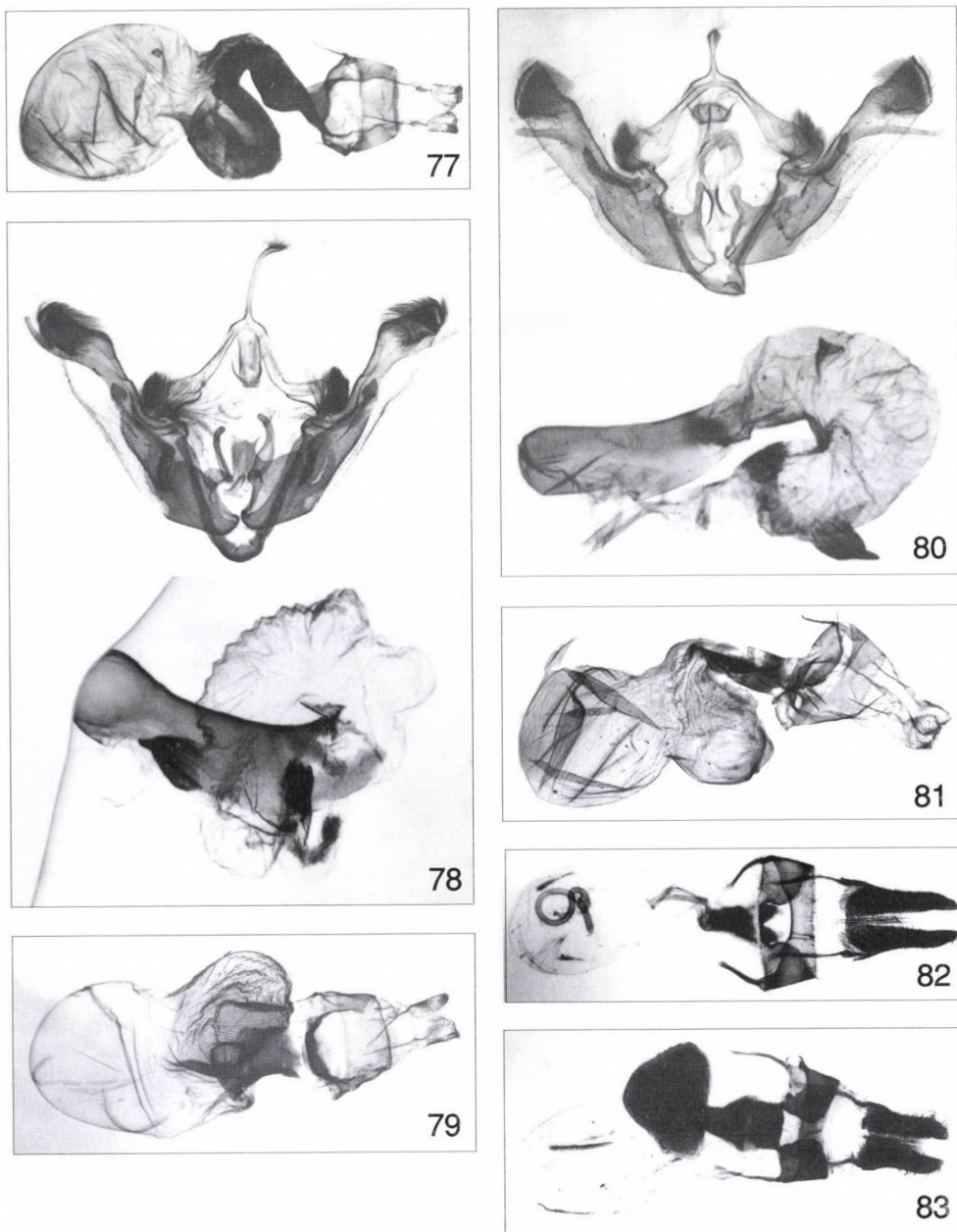
C. csorbai (HREBLAY et RONKAY, 1998)

Diagnosis: The genus belongs to the *Polymixis* s.l. generic complex, representing a small, compact group being rather remote from the other members of the genus-group. The species of the genus have a superficial resemblance to some *Polymixis* and *Mniotype* species (e.g. *P. rjabovi*, *M. solieri*, *M. spinosa*) but the forewings are shorter, more acute and the markings of the stigmata are conspicuously different. The male genitalia (see HREBLAY & RONKAY 1998, figs 1060, 1061) can be characterized by the acute, long cucullus with well-developed corona, lack of the subapical costal lobe, reduced harpe and ampulla, short, weak costal extension, rather long but almost smooth bars of carina and short, membranous vesica with a larger subbasal diverticulum projected ventrally, armed with a huge, thorn-like cornutus. The female genitalia is rather simple, with sclerotized but short ostium and ductus bursae, and a gelatinous appendix at apical part of corpus bursae, the structure of the corpus bursae and the signa are typical of most groups of *Polymixis*.

The configuration of the vesica is unique within the generic group, some *Mniotype* s. l. (e.g. *M. johanna* (STAUDINGER, 1900), *M. olivascens* (DRAUDT, 1950), *M. mucronata* (MOORE, 1882) (Fig. 80), *M. leucocyma* (HAMPSON, 1907), *M. lugens* RONKAY et VARGA, 1990), *Eremophysa* BOURSIN, 1958, and *Mniopamea* HACKER, 1992, species may have large cornuti but regularly two or more, and an additional, distal field of spinules is also present; in the species of *Mniotype* s. str. have no single cornuti but longer cornuti fields. In addition, the apical part of the valva (without subapical costal lobe but with long acute cucullus with strong corona and weak costal extension) is also typical only for the new genus.

The female genitalia (Figs 73–74) show closer connections with some *Polymixis* s. l. subgenera (e.g. *Myxinia* BERIO, 1985, *Bousinixis* HACKER et RONKAY, 1992) but the ostium and the ductus bursae are considerably smaller, shorter, and the gelatinous appendix, which is present in *Csorbatype*, is absent in the other taxa.

Description: Head strong, eyes large, globular, eye-lashes relatively short. Palpi short, upturned, pointed, proboscis well-developed, frons smooth, with double tufts, like in the *Lithophane* species. Antennae of male ciliate, those of female filiform. Thorax robust, collar broad, prothoracic



Figs 77–83. Genitalia figures. 77 = *Mniotype mucronata* (MOORE), female, Nepal; 78–79 = *M. csanadii* sp. n., 78 = holotype, 79 = paratype, female; 80–81 = *M. olivascens* (DRAUDT), 80 = male, Nepal, 81 = female, Nepal; 82 = *Apamea erythrographa* sp. n., holotype; 83 = *Apamea sanyibaglya* HREBLAY et RONKAY, paratype, female, Nepal

tuft forming small hood; metathoracic tuft small. Abdomen relatively strong, long, dorsal crest present. Forewing elongated with apex pointed-acute, outer margin slightly crenulate. Ground colour dark chocolate-brown, wing pattern rather indistinct, crosslines and stigmata visible, marked with blackish-brown and ochreous-whitish, outline of reniform stigma a characteristic ring of ochreous-whitish spots; hindwing rounded, rather small.

Male genitalia: uncus rather short, lanceolate with pointed apex, tegumen broad, low, penicular lobes small. Fultura inferior sclerotized, deltoidal, vinculum short, strong, V-shaped. Valva elongate, distally tapering, cucullus long, triangular with apex acute, corona long. Sacculus long, broad, clavi sclerotized, asymmetrical, longer, narrower on left side, broader, tricuspidate on right side. Harpe and ampulla reduced, costal extension fine, medium-long. Aedeagus short, cylindrical, slightly curved, carina with long, narrow ventral and shorter, broader dorsal plate, latter with fine sclerotized, serrated crest. Vesica short, upturned, with subbasal ventro-lateral diverticulum terminated in large, bulbed, thorn-like cornutus, dorso-lateral half finely scobinate. Abdominal coremata present.

Female genitalia (Figs 73–74): ovipositor conical, short, posterior papillae anales pointed, gonapophyses slender, fine. Ostium bursae broad, heavily sclerotized, rather short, quadrangular or higher, shield-like; ventral plate wider, its caudal edge slightly concave. Ductus bursae short, flattened or folded, strongly, granulosely sclerotized, trapezoidal or funnel-like, strongly tapering towards cervix bursae. Cervix rounded-conical, membranous with fine wrinkles, apical part of bursae copulatrix with flattened-quadratic or tubular-conical, gelatinous appendix at opposite side of ductus bursae. Corpus bursae large, elliptical, membranous with fine scobination and four long, broad signum-stripes.

Bionomics and distribution. The species of *Csorbatype* are typical members of the late autumnal – early winter aspects of the south-eastern Himalayan (eastern Nepal, northern Thailand, northern Vietnam) montane forest fauna. Both species are known only by a few examples (*C. informis*: 5 specimens, *C. csorbai*: 3 specimens), all were collected at light; the early stages are unknown.

Csorbatype csorbai (HREBLAY et RONKAY, 1998)
(Fig. 74)

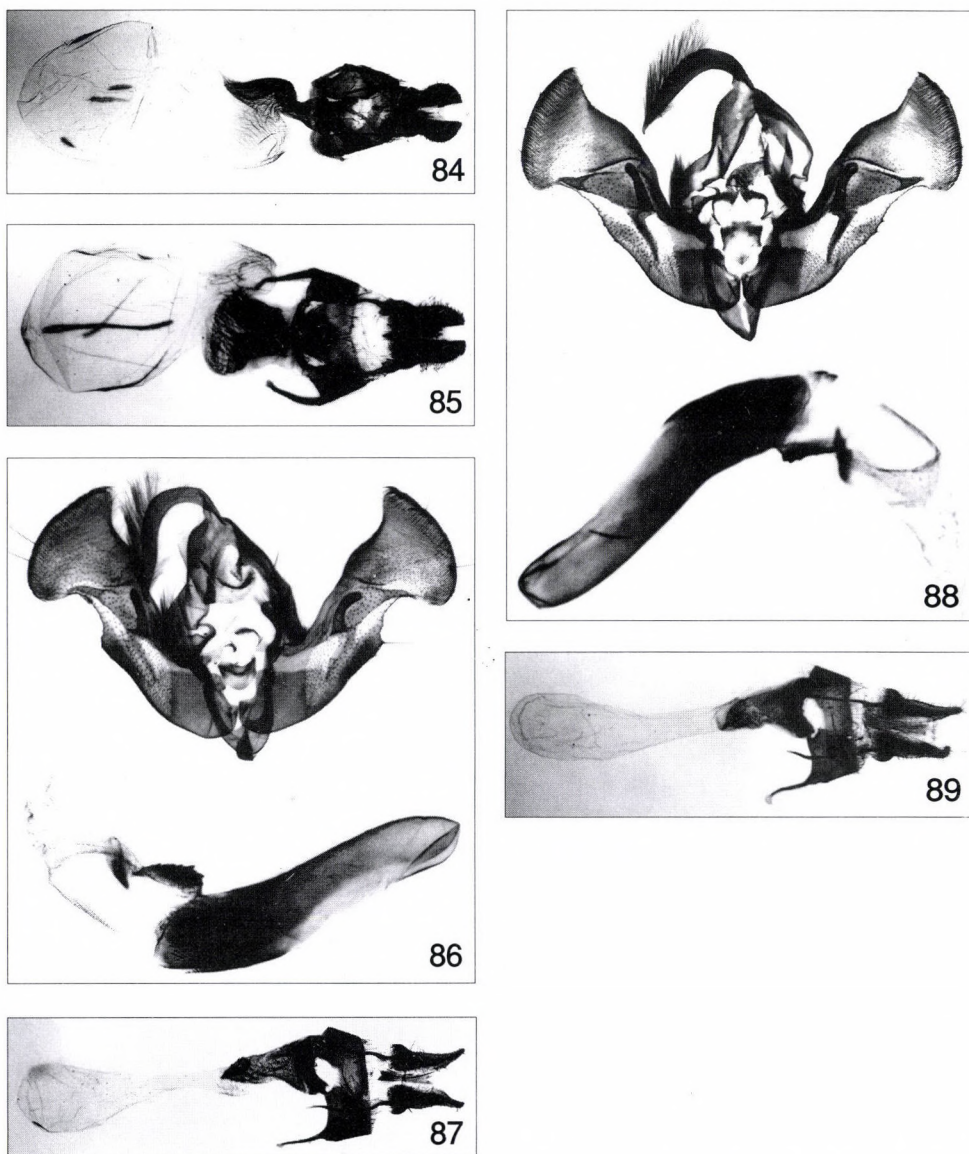
Material examined: Vietnam: holotype male, "Prov. Lao Cai, Sa Pa, 1300 m, 15–20.XI.1993, leg. Bankovics and Csorba" (coll. HNHM, Budapest); 1 male, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. PEREGOVITS & L. RONKAY (coll. HNHM, Budapest). Thailand: 1 female, Doi Inthanon, 18°34'N, 98°59'E, GPS, 2300 m, CHANTARAMONGKOL & MALICKY (coll. H. HACKER, Staffelstein).

Slide Nos RL4647 (holotype), RL6034 (males), HACKER 10548 (female).

The female genitalia of the two closely related species, *C. csorbai* and *C. informis* (HREBLAY et RONKAY, 1998) have not been described and compared, due to the lack of the female of *C. csorbai* during the description of the species-pair. The general characterization of the female genitalia is given in the descriptive part of the genus, the two species differ in the shape and size of the ostium and ductus bursae and the gelatinous appendix, as the ostium bursae is higher, more shield-like in *C. informis*, the ductus bursae is shorter, much strongly ta-

pering proximally and the gelatinuous appendage is narrow, more or less tubular. The description of the female genitalia of *C. csorbai* is given below.

Female genitalia (Fig. 74): ovipositor conical, short, posterior papillae anales pointed, gonapophyses slender, fine. Ostium bursae broad but rather short, quadrangular, sclerotized, ventral



Figs 84–89. Genitalia figures. 84 = *Apamea rectificata* HREBLAY et PLANTE, paratype, female, Nepal; 85 = *A. nigrostris* sp. n., holotype; 86–87 = *Chandata elegantula* HREBLAY et PLANTE, 86 = male, Nepal, 87 = female, Nepal; 88–89 = *C. maminti* sp. n., 88 = paratype, male, 89 = paratype, female

plate wider, its caudal edge slightly concave. Ductus bursae flattened, strongly, granulosely sclerotized, trapezoidal, constricted strongly towards cervix bursae. Cervix rounded conical, membranous with fine wrinkles, apical part of bursae copulatrix with flattened-quadratic, gelatinous appendix at opposite side of ductus bursae. Corpus bursae large, elliptical, membranous with fine scobination and four long, broad signum-stripes.

Bionomics and distribution. The species is known from the montane primary forest regions of the highest mountains of Thailand and Vietnam, the few specimens were collected at the beginning of the winter period.

***Mniotype chlorobesa* sp. n.**

(Figs 75, 155)

Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46.06'E, 22°20.9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6053.

Paratypes: 4 females, with the same data as the holotype (coll. HNHM, Budapest; M. HREBLAY, Érd and G. RONKAY, Budapest).

Diagnosis: the new species is the allopatric sibling of *Mniotype cyanochlora* HREBLAY et RONKAY, 1998, known from Nepal but differs externally by its stronger body, broader, somewhat shorter forewings with more diffuse dark markings. The female genitalia of the two species differ in the shape and size of the ostium and ductus bursae, the ostium of *M. chlorobesa* (Fig. 75) is much larger, more quadratic, the proximal half of ductus bursae, fused with cervix bursae is larger, rounded, less tapering caudally.

Description: wingspan 45–47 mm, length of forewing 21–23 mm. Female. Body robust, head and thorax dark moss-green mixed with brown, frons and palpi yellowish green, antenna filiform. Abdomen long, strong, dark grey-brown. Forewing rather long, broad, with apex pointed, outer margin crenulate. Ground colour dark mossy green, medial and terminal fields suffused with dark grey-brown. Subbasal, ante- and postmedial crosslines rather diffuse, sinuous, partly double, filled with lighter green. Orbicular and reniform stigmata incompletely encircled with ochreous green and blackish brown, filled with green and darker grey; claviform rounded, filled with dark grey-brown. Subterminal interrupted, waved greenish line defined with diffuse blackish grey patches on both sides. Terminal line a row of blackish arches, cilia as ground colour. Hindwing dark, shining grey-brown, veins slightly darker, discal spot small, diffuse; cilia ochreous-greenish. Underside of forewing suffused strongly with dark greyish brown, that of hindwing paler ochreous grey, irrorated with dark brown, especially in marginal area. Discal spot and transverse line diffuse but rather strong on hindwing, much weaker, obsolescent on forewing. Male unknown.

Female genitalia (Fig. 75): ovipositor relatively long, conical, posterior papillae long, weakly sclerotized, gonapophyses long, slender. Ostium bursae large, flattened, heavily sclerotized, more or less quadrate with rounded angles and with stronger margins. Distal part of ductus bursae almost as large as ostium, somewhat shorter but wider, flattened, heavily sclerotized. Proximal half of ductus bursae fused partly with cervix bursae, dorsal plate and posterior half of ventral plate smoothly sclerotized, flattened, cervical (ventral) part semiglobular, strongly ribbed-cristate. Corpus bursae spacious, globular-discoidal, with four long, ribbon-like signa.

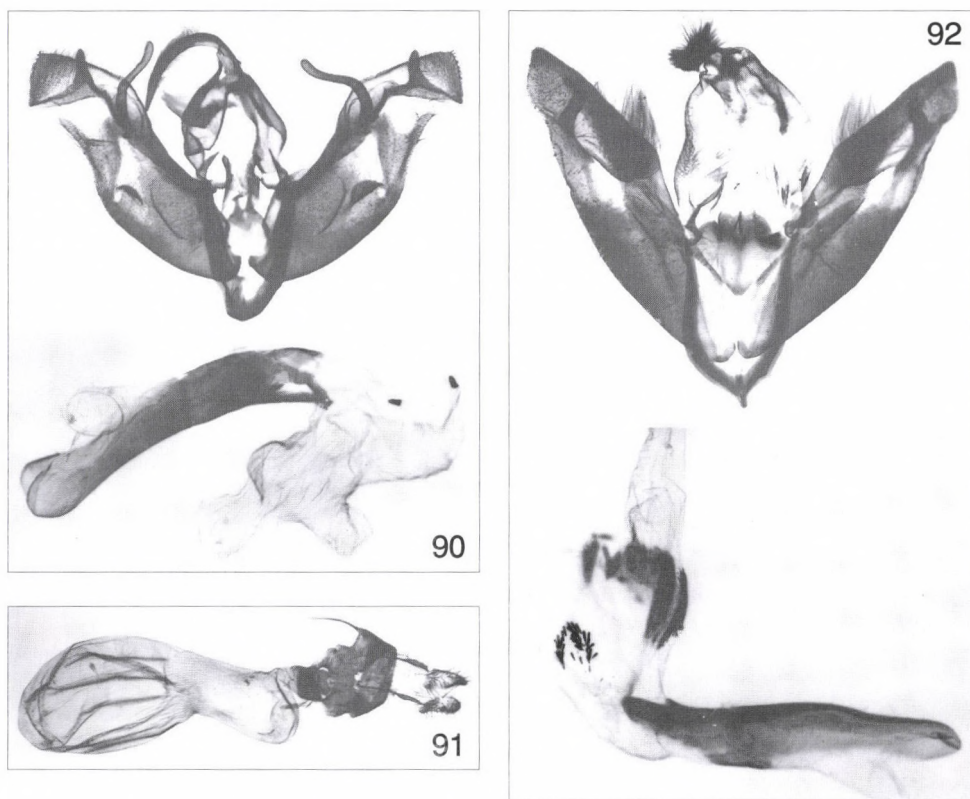
Mniotype mucronata (MOORE, 1882)
(Figs 76–77, 156)

Type material examined: Lectotype male, paralectotype male, Darjeeling, coll. ATKINSON (MNHU, Berlin), slide No. HM8374 (lectotype).

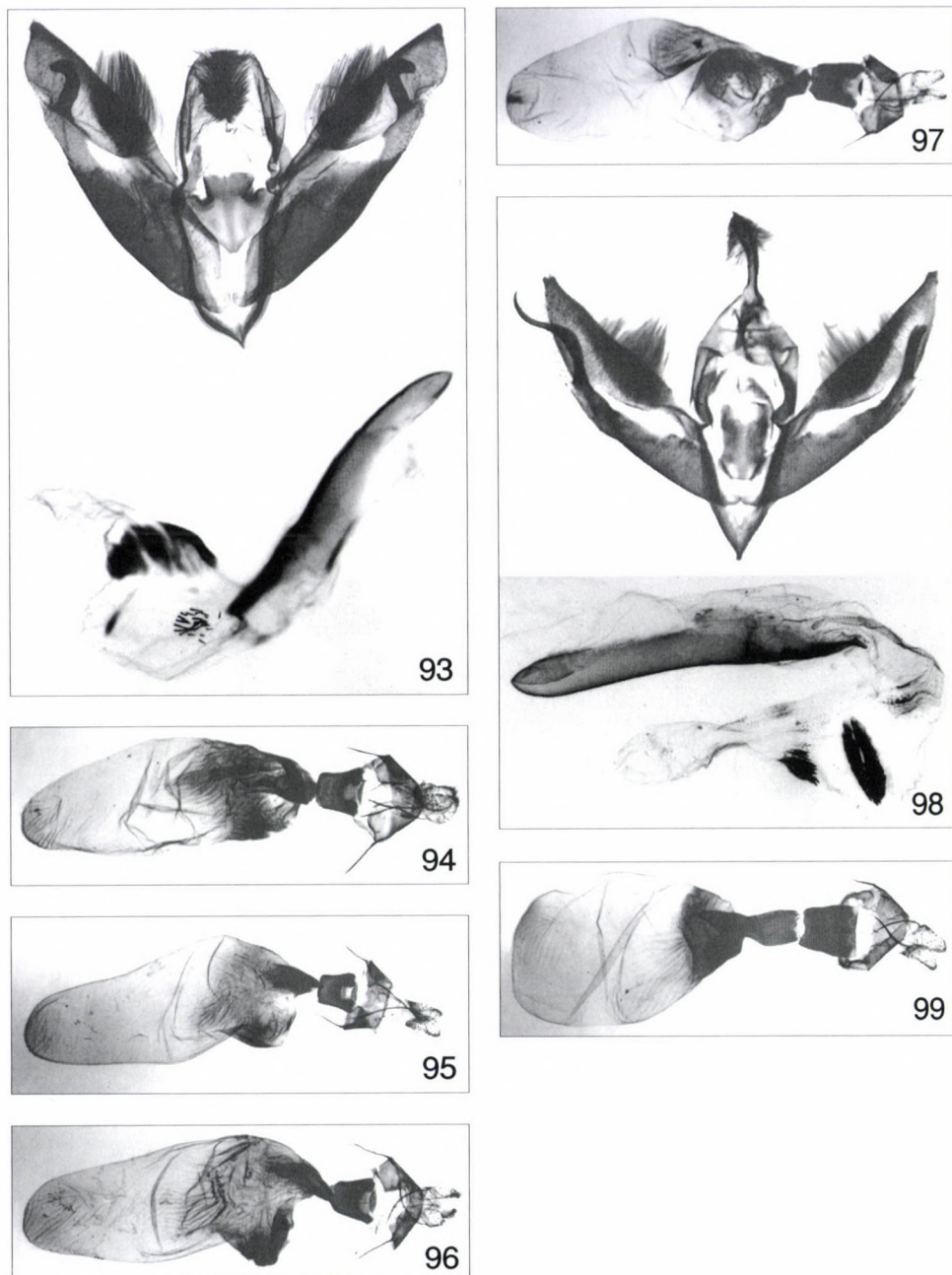
Additional material examined. Nepal: 1 male, Koshi, Terhathum area, Chitre, 2500 m, 87°24'E, 27°05'N, 17.X.1996, leg. GY. M. LÁSZLÓ and G. RONKAY; 1 male, Mechi, Taplejung area, Lal Kharka, 2250 m, 10.X.1994, leg. HREBLAY & CSÖVÁRI; 1 female, Nepal, 6 km NNE of Muldi (Murre), 2835 m, 14.X.1995, 85°58'E, 27°23'N, leg. M. HREBLAY; 1 female, East Nepal, 2 km NE of Suketar, Lali Kharka, 2600 m, 23.XI.1997, leg. KARMA SHERPA (coll. M. HREBLAY and G. RONKAY).

Slide Nos HM7311, RL6193 (males), HM8404, HM10598 (females).

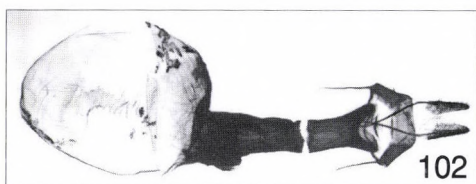
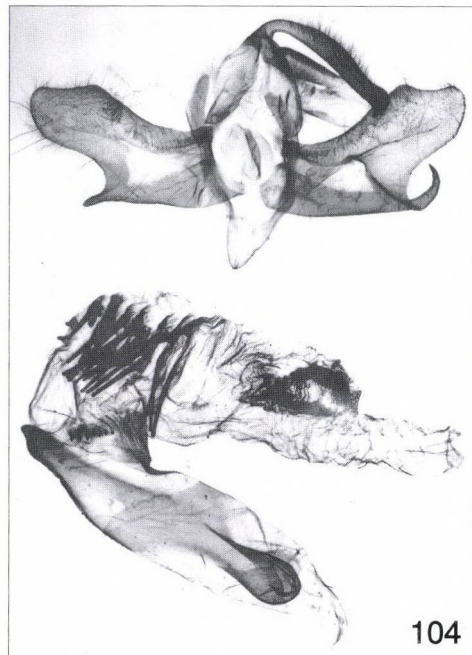
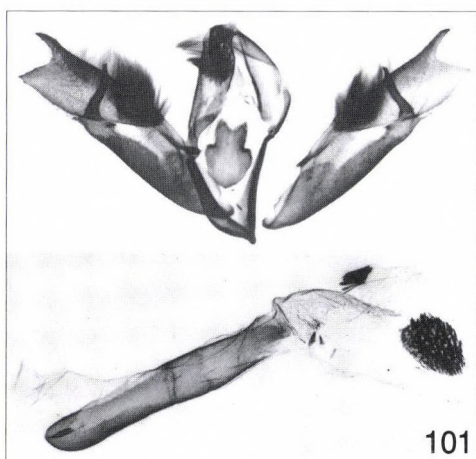
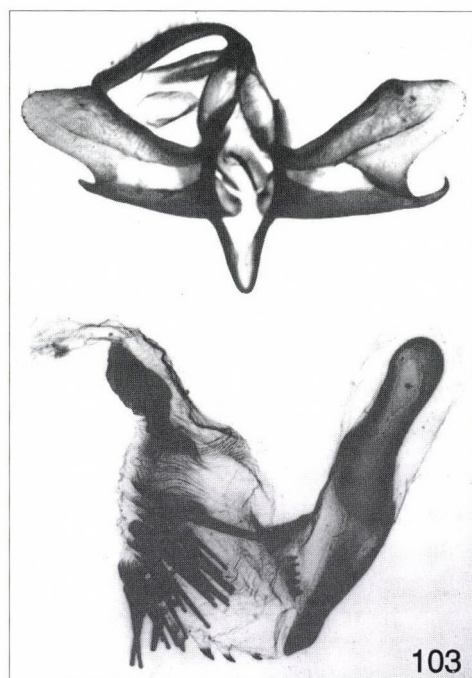
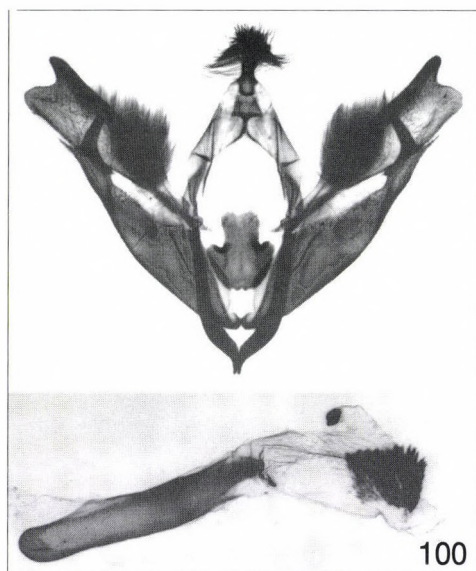
Diagnosis. Detailed study on the material of "*M. mucronata*" pointed out that there are two closely related, allopatric species in the southern Himalayan re-



Figs 90–92. Genitalia figures. 90–91 = *Actinotia stevenswani* sp. n., 90 = holotype, 91 = paratype, female; 92 = *Diptherocone impectinata* sp. n., holotype



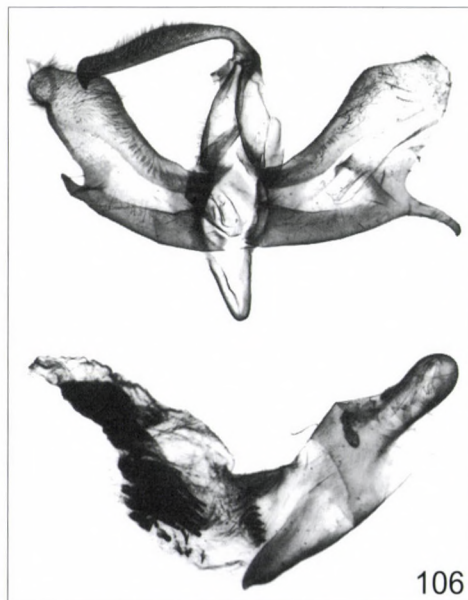
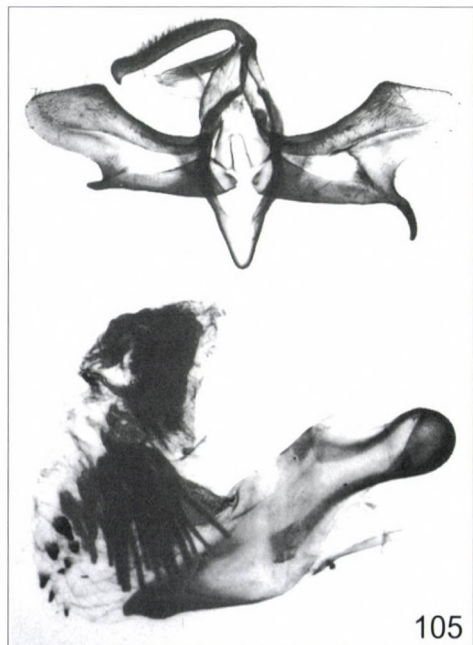
Figs 93–99. Genitalia figures. 93–95 = *Diphtherocome impectinata* sp. n., 93 = paratype, male, 94–95 = paratype, females; 96–97 = *D. chrysochlora* (HAMPSON), females, Nepal; 98–99 = *D. bryochlora* sp. n., 98 = holotype, 99 = paratype, female



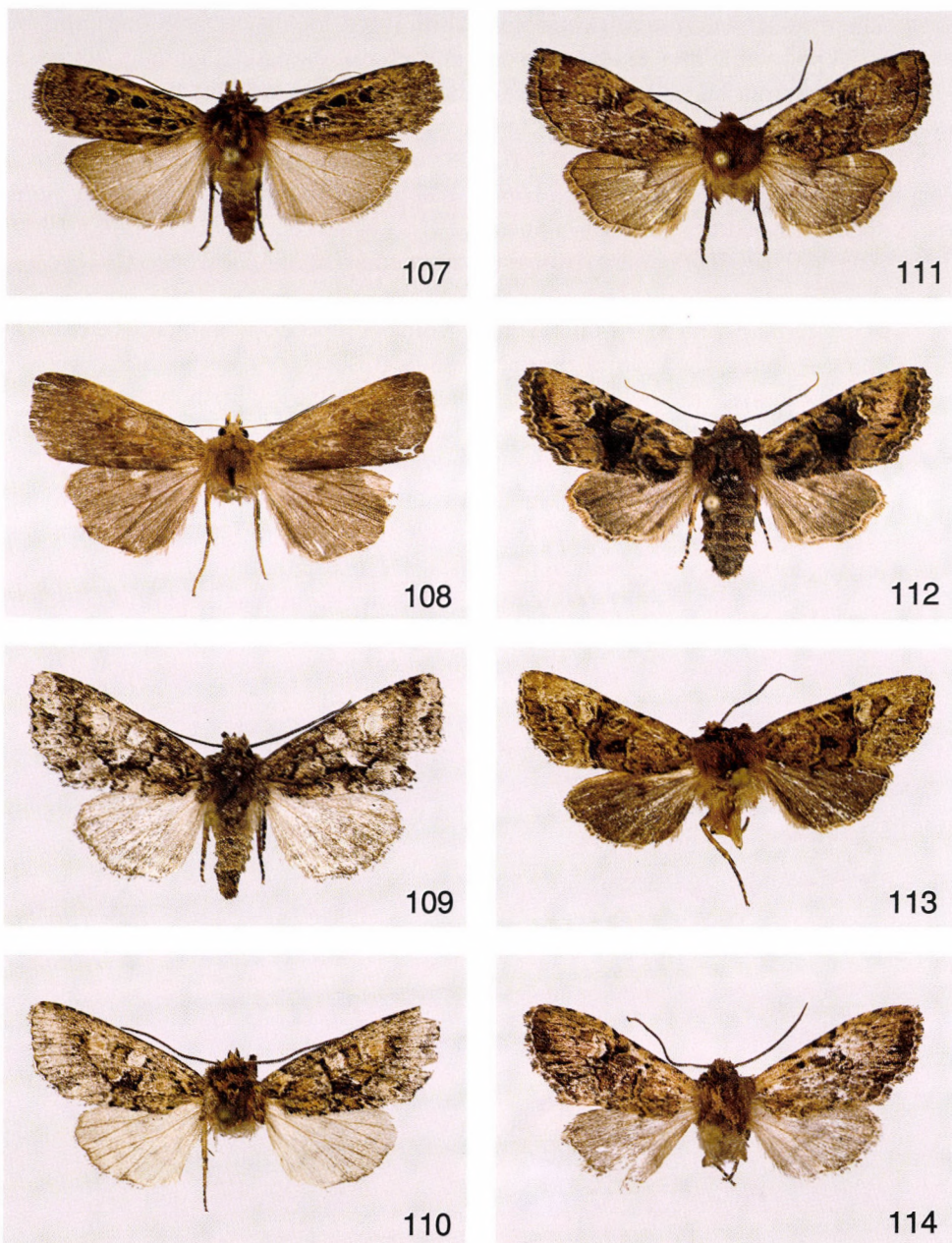
Figs 100–104. Genitalia figures. 100 = *Diphtherocome chloronympha* sp. n., holotype; 101–102 = *D. thaumasia* (HREBLAY et RONKAY), 101 = male, Nepal; 102 = holotype; 103–104 = *Amphipyra owadai* sp. n., 103 = holotype, 104 = paratype, male

gion. The true *M. mucronata* occurs in Sikkim (type locality: Darjeeling) and in eastern Nepal while the species found in Central Nepal (Langtang, Ganesh Himal, Annapurna Himal) represents an undescribed taxon. It is worth to mention that this undescribed species and its male genitalia were illustrated by YOSHIMOTO (1994, fig. 505; pl. 84, fig. 28) under the name '*Valeria*' *pardaria* MOORE. The lectotype of *M. mucronata* has already designated and a typical male specimen of the species is illustrated (HREBLAY & RONKAY, 1998: 190–191; plate 150, fig. 21) but a part of the specimens belongs, however, to *M. csanadii*.

M. mucronata and *M. csanadii* differ from each other by numerous external and genital features, the main differences are as follows: *M. mucronata* is somewhat smaller in size, its medial area is less darkened, the whitish outlines of the stigmata are stronger, the reniform is less flattened, less constricted at middle, the subterminal line is more indistinct, the hindwing is paler and the underside is also paler with weaker greyish-brown suffusion. In the male genitalia the cuculli of *M. mucronata* (Fig. 76) are larger, more quadratic with stronger, triangular sub-apical costal lobe and shorter, straighter costal extension than in *M. csanadii* (Fig. 78), the harpe is shorter, more rounded, the clavi are significantly shorter, thicker at base, the fultura inferior is smaller, apically much narrower, the aedeagus is



Figs 105–106. Male genitalia of *Amphipyra owadai nepalensis* ssp. n., 105 = holotype, 106 = paratype, male



Figs 107–114. 107 = *Hermonassa sobeyi* sp. n., holotype; 108 = *Diarsia ypsiloidea* sp. n. holotype; 109–110 = *Dryobotodes himalayensis* sp. n., 109 = holotype, 110 = paratype, Nepal; 111 = *Himalistra jeleni* sp. n., holotype; 112 = *Nyctycia stenoptera violascens* ssp. n., paratype, female; 113 = *N. dissimilis* sp. n., holotype; 114 = *N. szabokyi* sp. n., holotype



Figs 115–122. 115 = *Nyctycia szaboki* sp. n., paratype, female; 116–117 = *N. nivescens* sp. n., 116 = holotype, 117 = paratype, female; 118 = *N. endoi hiemalis* ssp. n., holotype; 119 = *N. ionochlora* sp. n., holotype; 120 = *N. albivariiegata* sp. n., holotype; 121 = *N. niveifera* sp. n., holotype; 122 = *Potnyctycia frontieri* sp. n., holotype

narrower, longer, with longer, basally dentate ventral bar of the carina, the medial cornutus of the vesica is considerably smaller, its basal bulb much weaker. In the female genitalia the ostium bursae of *M. mucronata* (Fig. 77) is significantly narrower, longer, lyriform with long caudal arms, not half-ring-like, the ductus bursae is longer, more folded, its sclerotization is considerably stronger, but without the long proximal dorsal crest present in *M. csanadii* (Fig. 79), the cervix bursae is with large, sclerotized, folded laminae which are absent in its twin species and the basal part of the ductus seminalis is also sclerotized, this part is membranous in *M. csanadii*.

Redescription: wingspan 29–31 mm, length of forewing 14–15 mm. Male. Head and thorax greyish mossy-green mixed with dark brown and ochreous, collar and tegulae with diffuse dark markings, metathoracic tuft dark reddish-brown. Antennae shortly ciliate, palpi short, upturned, sides blackish grey. Forewing elongate, narrow, with apex pointed, outer margin evenly arcuate. Ground colour pale mossy green, irrorated with olive-grey and brownish, medial area with stronger greyish suffusion. Ante- and postmedial crosslines and orbicular and reniform stigmata rather sharply defined, crosslines double, sinuous, dark grey filled with whitish-greenish, outlines of stigmata whitish green and grey, filled with ground colour. Subbasal line short, sinuous, double, medial line narrow, sinuous, dark grey stripe; claviform stigma represented by its short, dark grey apical arch. Subterminal indistinct, whitish defined with greenish-grey patches and a few dark streaks on veins, terminal line sharp, fine, black; cilia as ground colour, spotted with ochreous-greenish. Hindwing shining whitish-ochreous, suffused with pale brownish grey, veins darker, discal spot and transverse line diffuse but visible. Terminal line dark brown, cilia ochreous with greyish medial stripe. Underside of wings shining, pale ochreous, inner area of forewing suffused, costal part of hindwing irrorated with greyish brown. Discal spot of forewing rather strong, marked by lighter patch, transverse line and discal spot of hindwing rather sharp, dark brown. Female as male, with slightly darker hindwings; antenna filiform.

Male genitalia (Fig. 76): uncus long, slender, fine, tegumen broad, rather low, peniclar lobes large, densely hairy. Fultura inferior subdeltoidal, small, apical process only slightly dilated terminally; vinculum strong, very short, V-shaped. Valvae long, symmetrical except clavi, medially slightly constricted; cucullus broader, more or less quadrangular with apex pointed, covered with long hairs; corona well-developed. Sacculus rather short, strong, clavi asymmetrical, left clavus broader, longer, simple, right clavus double: main lobe narrower, shorter with small, rounded basal prominence. Harpe represented only by its long, sclerotized basal bar, ampulla small, flattened-wrinkled, apically rounded. Costal extension long, straight, finely pointed, subapical costal lobe very small, triangular. Aedeagus rather short, cylindrical, carina with shorter, dentate ventro-lateral and longer, lanceolate, smooth lateral bar opposite. Vesica tubular, everted forward, medial part dilated, recurved ventrally, distal third upturned, tapering. Basal and medial parts hyaline, distal part scobinate, with bulbed, short but strong cornutus, large, more or less cubic subterminal diverticulum and globular terminal one at opposite side, covered with long, fine spinules.

Female genitalia (Fig. 77): ovipositor weak, posterior papillae anales more or less quadratic, gonapophyses short, fine. Ostium bursae more or less lyriform with longer caudal arms, relatively long but narrow. Ductus bursae sclerotized, long, flattened, strongly folded. Cervix bursae large, with strong, sclerotized, folded laminae; apical part of corpus bursae with stronger wrinkles. Corpus bursae discoidal, membranous, with four long, fine, narrow signum-stripes.

Bionomics and distribution. *M. mucronata* is known from Sikkim and from the eastern part of the Nepal Himalaya (Koshi, Mechi).

***Mniotype csanadii* sp. n.**
(Figs 78–79, 157)

Holotype: male, "NEPAL, Langtang, 2860 m, near Chandrabari, 85°21'E, 28°05'N, 25.IX.1994, leg. Csorba & Ronkay", slide No. RL5318 (coll. HNHM, Budapest).

Paratypes. Nepal: 2 males, with the same data as the holotype; 1 male, Ganesh Himal, above Nesim, 2300 m, 85°15,5'E, 28°06,5'N, 23.X.1995, leg. L. PEREGOVITS & L. RONKAY; 1 male, 1 female, Ganesh Himal, 2420 m, 2 km W Gholjong, 85°18'E, 28°11'N, 12.X.1995, leg. L. PEREGOVITS & L. RONKAY; 1 male, Ganesh Himal, above Godlang, 2560 m, 21.X.1995, leg. M. FIBIGER; 1 male, Ganesh Himal, 2950 m, 7 km NW Godlang, 85°14'E, 28°10'N, 20.IX.1995, leg. B. HERCZIG & GY. M. LÁSZLÓ; 1 female, Annapurna Himal, Nangethanti, 2500 m, 83°43'E, 28°23'N, 4.X.1994, leg. G. CSORBA & L. RONKAY 1 female, Nepal, 4 km SW of Kalinchok peak, 3000 m, 7.VIII.1995, 86°01'E, 27°23'N, leg. M. HREBLAY & T. CSÖVÁRI (colls HNHM, Budapest; M. FIBIGER, Sorø; B. HERCZIG, Tata; M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos RL6297 (male), HM7674, RL5609 (females).

Diagnosis. The new species is a close relative of the preceding species, the detailed comparison of the two species is given in the diagnosis of *M. mucronata* (MOORE, 1882).

Description: wingspan 32–33 mm, length of forewing 15–15,5 mm. Male. Head and thorax greyish mossy-green mixed with dark brown and ochreous, collar and tegulae with diffuse dark markings. Antennae shortly ciliate, palpi short, upturned, sides blackish grey. Forewing elongate, narrow, with apex pointed, outer margin evenly arcuate. Ground colour pale mossy green, irrorated with olive-grey and brownish sc. les, medial area with stronger greyish suffusion and dark brownish irroration. Wing pattern rather sharply defined, ante- and postmedial crosslines double, sinuous, dark grey filled with whitish-green; subbasal line short, sinuous, double, blackish with strong dark brown-grey definition, medial line narrow, sinuous, dark grey stripe. Orbicular and reniform stigmata rather big, outlines blackish grey and whitish green, their filling greenish with variably strong greyish-brownish covering; orbicular rounded or flattened, reniform long, narrow, medially constricted, with stronger projection outwards at lower extremity. Claviform stigma represented by its short, dark grey apical arch, filled often with greyish. Subterminal strongly sinuous, whitish, defined with greenish-grey patches and by dark grey zone at outer side, terminal line a row of black archs with greenish tips; cilia as ground colour, spotted apically with dark grey-brown. Hindwing suffused with dark greyish brown, veins somewhat darker, discal spot and transverse line diffuse but visible. Terminal line dark brown, cilia ochreous with greyish medial stripe. Underside of wings shining, pale ochreous, suffused relatively strongly with greyish brown, transverse line and discal spot present on both wings. Female. As male, antennae filiform.

Male genitalia (Fig. 78): uncus slender, tegumen broad, rather low, penicular lobes narrow, long, densely hairy. Fultura inferior more or less quadrangular; vinculum strong, very short, more or less U-shaped. Valvae long, symmetrical except clavi, cucullus relatively small, rounded triangular with apex rounded, covered with long hairs; corona short. Sacculus rather short, strong, clavi long, more or less falciform with asymmetrical basal parts: left clavus with broader, larger basal lobe, right clavus with small, rounded basal prominence only. Harpe represented by its long, sclerotized basal bar, ampulla small, flattened, triangular-lanceolate. Costal extension long, narrow, finely arcuate, subapical costal lobe rather broad, rounded triangular. Aedeagus short, cylindrical, carina with shorter ventro-lateral and longer, lanceolate, smooth lateral bar. Vesica broadly tubular, everted forward, medial part slightly dilated, recurved ventrally, distal third upturned, tapering. Basal and medial parts membranous, with three small, semiglobular diverticula, distal part with large, bulbed cornutus, large, more or less conical subterminal diverticulum and small cornuti field terminad, covered with long, fine spinules.



Figs 123–130. 123 = *Meganyctycia fansipana* sp. n., holotype; 124 = *Isolasia caovansungi* sp. n., paratype, male; 125 = *I. jacktordoffi* sp. n., holotype; 126–127 = *I. pardaria* (MOORE), 126 = male, Nepal, 127 = female, Nepal; 128 = *I. dilutissima* sp. n., holotype; 129–130 = *Daseuplexia brevipennata* sp. n., 129 = holotype, 130 = paratype, female



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Figs 131–138. 131 = *Daseuplexia lageniformis* (HAMPSON), male, Nepal; 132 = *D. porphyrea* gen. et sp. n., holotype; 133 = *Paranyctycia miraculosa* sp. n., holotype; 134 = *Agrochola flavirena* (MOORE), female, Nepal; 135 = *A. kosagezai* sp. n., holotype; 136 = *Agrochola* sp. near *kosagezai* sp. n., female, Nepal; 137 = *A. pallidilinea* sp. n., holotype; 138 = *A. albirena annamica* ssp. n., holotype

Female genitalia (Fig. 79): ovipositor medium-long, weak, gonapophyses short, fine. Ostium bursae broad but short, sclerotized, half-ring-like. Ductus bursae sclerotized, rather straight, flattened, with upturned, recurved lateral margins, proximal end with long, straight, sclerotized dorsal crest. Cervix bursae large, rounded, strongly ribbed, with larger sclerotized plate nearby ductus bursae; apical part of corpus bursae also wrinkled. Main part of corpus bursae discoidal, membranous, with four long, fine, narrow signum-stripes.

Bionomics and distribution. The new species was found in the central parts of Nepal (Langtang, Ganesh Himal, Annapurna Himal). The moths were collected at the end of September–beginning of October, at medium high altitudes, the main habitats are old, mixed oak forests and mossy forests.

Etymology: The new species is dedicated to Mr DÁVID CSANÁDI of the Department of Zoology of the Hungarian Natural History Museum.

***Apamea erythrographa* sp. n.**

(Figs 82, 158)

Holotype: female, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, I.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6063.

Paratypes: 2 females, with the same data as the holotype (coll. HNHM, Budapest and G. RONKAY, Budapest).

Diagnosis: the new species is closely related to *A. glenura* (SWINHOE, 1895) and *A. sanyibaglya* HREBLAY et RONKAY, 1998. It is somewhat larger than either of its allied taxa, the ground colour is greyish, without greenish irroration but with reddish patches in basal and medial areas, the crosslines are less sharply defined, without stronger light filling, the reniform stigma is also more diffuse, its white marking less extensive, the W-mark of the subterminal is missing. The new species also resembles *A. rectificata* HREBLAY et PLANTE, 1995 but its forewing is more pointed, the ground colour is greyish, not ochreous-brown or reddish-brown, the basal area is much darker, the stigmata and the ante- and postmedial crosslines are more indistinct, their pale definition is much weaker.

The female genitalia of *A. erythrographa* (Fig. 82) differ from those of *A. sanyibaglya* (Fig. 83) by its weaker, shorter ostium bursae, much weaker ductus bursae without huge, sclerotized-gelatinous proximal lobe, the signa are also finer, shorter; from *A. rectificata* (Fig. 84) by its much longer, acute ovipositor, broader but weaker ostium bursae, shorter ductus bursae without stronger, dilated proximal part, more conical cervix bursae and by longer signa.

Description: wingspan 49–56 mm, length of forewing 23–27 mm. Female. Head and thorax dark grey mixed with red-brown and a few whitish, tip of collar, tegulae and thoracic tufts marked with blackish grey; abdomen greyish, dorsal crest grey-brown. Forewing elongate, rather high triangular with apex pointed, outer margin finely crenulate. Ground color dark grey, basal and medial areas suffused with reddish brown, irrorated with blackish and dark brown. Basal dash very

short, spot-like, subbasal, ante- and postmedial crosslines rather diffuse, double, blackish brown, filled with ochreous- or reddish brown and grey; medial line a darker, interrupted shadow. Stigmata present, large, orbicular flattened, encircled partly with blackish and a few whitish, filled with whitish grey and grey-brown. Reniform large, elliptical-lunulate, incompletely encircled with dark brown-grey and blackish, outer part with sharply defined, interrupted white(ish-ochreous) stripe, its centre dark grey and blackish; claviform a fine blackish arch. Subterminal rather indistinct, sinuous, whitish-ochreous, without stronger W-mark, defined by a row of diffuse, blackish brown arrow-heads. Terminal line fine, sinuous, blackish grey, cilia ochreous-grey, spotted with grey-brown. Hindwing suffused strongly with greyish brown, veins, diffuse discal spot and transverse line somewhat darker; cilia ochreous, spotted with grey.

Female genitalia (Fig. 82): ovipositor strong, relatively long, conical, ostium bursae narrow, short, with sclerotized ventral ring and weaker, larger, medially incised dorsal plate. Ductus bursae short, funnel-like, strongly tapering anteriorly. Its walls strongly folded, membranous with stronger granulation. Cervix bursae short, conical, hyaline, corpus bursae elliptical-ovoid, weakly membranous with two rather short signum stripes.

Bionomics and distribution. The three closely related species, *A. sanyibaglya* (C Nepal), *A. glenura* (E Nepal, Sikkim) and *A. erythrographa* (Vietnam) appear to be completely allopatric; their habitats are montane broad-leaved forest zones between 2000–3000 m a.s.l., depending on the actual area of the Himalayan chain.

***Apamea nigrostris* sp. n.**
(Figs 85, 159)

Holotype: female, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6062.

Paratype: 1 female, from the same locality, 29.XI.1997, leg. L. PEREGOVITS & L. RONKAY (coll. G. RONKAY, Budapest).

Diagnosis: The new species is the allopatric sibling of *A. mikkolai* HREBLAY et RONKAY, 1998, occurring in the Nepal Himalaya, but the forewings are broader, the ground colour is paler, more variegated with ochreous-brownish, the blackish brown stripes and patches are larger, stronger, the crosslines weaker, more obsolescent, the orbicular and the reniform stigmata are lighter, latter more whitish.

Description: wingspan 45–52 mm, length of forewing 20–25 mm. Female. Head and thorax dark ochreous brown mixed with dark brown and whitish, collar and tegulae marked with blackish-brown. Abdomen more ochreous, lateral ridges strong, dorsal crest dark brown. Forewing elongate, broad, ground color shining, pale tobacco-brown with ochreous-bronze shade, irrorated with darker brown and ochreous. Basal dash very long, blackish, basal area with shorter black streak at inner margin. Ante- and postmedial crosslines obsolescent, double, brownish with ochreous filling, medial line represented by short, diffuse streak at costa. Stigmata present, sharply defined, orbicular stigma flattened, reniform elliptical-lunulate, both encircled with black, most parts of reniform white or whitish, with dark grey spot at lower edge. Claviform short, blackish brown, with broad dark brown stripe from basal dash to postmedial line. Subterminal ochreous, sinuous, W-mark in-

conspicuous, defined by dark brownish patches on both sides and a few blackish arrowheads. Hind-wing ochreous, inner third and marginal area suffused with dark brown, veins also dark, discal spot and transverse line present but diffuse, pale. Male unknown.

Female genitalia (Fig. 85): ovipositor strong, relatively long, conical, posterior papillae anales rather strong, medium-long; gonapophyses thick, medium-long. Ostium bursae wide, U-shaped with strongly sclerotized ventral ring and reversed cordiform, sclerotized medial plate, dorsal surface membranous. Ductus bursae medium-long, broad, flattened, with granulosely sclerotized, strong folds and crests. Cervix bursae broad, conical, ribbed, finely sclerotized, corpus bursae elliptical-ovoid, weakly membranous, with four long, fine signum-stripes.

***Chandata maminti* sp. n.**

(Figs 88–89, 160–161)

Holotype: female, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest).

Paratypes. Vietnam. 1 female, with the same data as the holotype; 5 males, 1 female, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6. and 8.XII.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest; BMNH, London and G. RONKAY, Budapest). Thailand. Prov. Chiang Mai: 1 female, Doi Inthanon, 18°34'N, 98°59'E, GPS, 2300 m, 17.I.1997, leg. MALICKY (coll. H. HACKER, Staffelstein); 1 male, Mt. Doi Inthanon, NP, 2300 m, 14.XI.1998; 5 males, 3 females, 20 km NW of Sop Kha, 2 km S of Kop Dong, 1800 m, 15.XII.1998; 6 males, 2 females, 20 km NW of Mae Ai, 1650 m, 16.XII.1998; 6 males, Mt. Doi Phahompok, 18 km NW of Fang, 2100 m, 17.XII.1998; 10 males, 15 females, Mt. Doi Phahompok, 16 km NW of Fang, 2000 m, 8. & 18.XII.1998, leg. M. HREBLAY, Y. SHERPA & I. Soós (coll. HREBLAY, Érd).

Slide Nos HM10488, HM11273, RL6058 (males), HM10959, RL6187 (females).

Diagnosis: the new species is the eastern sister-species of *C. elegantula* HREBLAY et PLANTE, 1995. *C. maminti* differs from *C. elegantula* in being sexually dimorphic. The male of *C. maminti* differs from its sibling species by its much darker colouration of the body and the forewing with strong brownish grey suffusion, the whitish elements of the wing pattern are reduced, the dark markings are more distinct. The female of the new species is also significantly darker than that of *C. elegantula*, but the whitish-greyish ground colour is more extensive on the forewing than in case of the male. The females of the two species differ mostly by their size and the colouration of the forewing, *C. maminti* being somewhat larger, the whitish-bluish grey ground colour is covered strongly by shining, plumbeous-violaceous suffusion, especially in the basal field and in the inner part of the marginal area, the crosslines are sharper, the black patches of the cell and the tornal part are much larger.

The male genitalia of the two sibling species (see Figs 86, 88) differ in several details: *C. maminti* (Fig. 88) has stronger, less curved uncus, larger, apically broader fultura, much broader distal part of valva, neck of cucullus significantly less constricted, higher, wider cucullus with less curved outer margin, longer harpe, stronger, thicker, less tapering ampullar process, larger, longer aedeagus

with narrower dentate basal plate and longer, stronger cornutus. The female genitalia of the two species are very close, *C. maminti* (Fig. 89) has somewhat broader ostium bursae with larger, broader, less deeply arcuate dorsal plate and the ductus bursae is less strongly constricted at posterior third. The female genitalia of *C. elegantula* are first illustrated in Fig. 87.

Description: wingspan 29–38 mm, length of forewing 13–17 mm. Male. Head and thorax whitish grey with some bluish shade, collar and tegulae marked with blackish, metathoracic tuft large. Palpi short, porrect, sides blackish; antenna rather strongly bipectinated, legs blackish with white(ish) outer sides. Abdomen dark grey with whitish hairs at base, lateral ridges strong, blackish, dorsal crest well-developed, tufts blackish with whitish tip. Forewing rather short, broad triangular with apex pointed, ground colour pale whitish grey with bluish shade, suffused intensely with shining plumbeous violet-grey and brown, scaling finely reticulate. Wing pattern blackish, ante- and postmedial crosslines double, slightly sinuous, rather diffuse, filled with whitish or pale greyish. Subbasal line represented by three strong, black triangular spots, medial fascia diffuse, shadow-like, subterminal diffuse, sinuous, whitish. Orbicular and reniform stigmata large, more or less rounded, incompletely encircled with blackish, filled with whitish grey. Cell with sharp black triangle between them and behind reniform, costa with large quadrangular black patch between postmedial and subterminal; claviform absent. Terminal line absent, cilia whitish, spotted with black and dark grey. Hindwing whitish, costal and marginal areas widely suffused with dark brownish-grey, veins darker, discal spot absent. Underside of both wings suffused with blackish grey except whitish inner area of hindwing, discal spots and transverse lines reduced.

Female. As male but antenna filiform, head, thorax and forewing whitish-bluish grey, dark plumbeous-violet and brownish suffusion restricted to basal area and inner half of marginal field, dark pattern of wing more sharply defined, blackish patches larger, deeper.

Male genitalia (Fig.): uncus long, strong, evenly curved, with apex finely hooked. Tegumen high, narrow, penicular lobes large, fultura inferior small, pentagonal; vinculum short, rounded. Valva medium-long, broad, distally slightly dilated. Cucullus wide, high, acute triangular, outer margin evenly arcuate; corona strong. Sacculus small, triangular, clavus triangular, finely wrinkled, setose. Harpe strong, flattened, digitiform, with slightly curved apical part, its tip rounded. Ampullar process long, cuneate with acute tip. Aedeagus short, distal third finely curved, dorsal and lateral parts covered with fine spinules. Vesica short, tubular, basal part with serrated ventral plate, medial part dilated, with fine, acute, broad-based cornutus sitting on semiglobular diverticulum; distal third tapering, scobinate.

Female genitalia (Fig.): ovipositor strong but rather short, acute, sclerotized bars within posterior papillae anales rather weak; gonapophyses strong. Ostium bursae broad but short, sclerotized, finely arcuate, ventral plate somewhat longer, broader. Ductus bursae medium-long, flattened, strongly scobinate, gradually tapering proximally. Cervix bursae very small, conical, hyaline, corpus bursae hyaline, long, tubular, slightly dilated at anterior half forming elliptical fundus.

Bionomics and distribution. The species was found in the primary forests of the higher areas of the Fan-si-pan Mts and in Thailand in the Doi Inthanon and the Phahompok Mts, the specimens were collected at light. It seems to be a member of the early winter aspect, the female specimens were freshly emerged at the beginning of December, some of the males were already a bit worn at the same time.

Etymology: the new species is dedicated to Miss EMESE ("Maminti") SCHMIDT.

***Actinotia stevenswani* sp. n.**
(Figs 90–91, 162)

Holotype: male, "VIETNAM, Prov. Lao Cai, Sa Pa, 1300 m, 29.XI.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHN, Budapest). Slide No. RL6059.

Paratypes: 1 female, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. PEREGOVITS & L. RONKAY (coll. HNHN), a large series of both sexes from the same locality, 29–30.VIII.1998, leg. A. KUN (colls. HNHN, M. HREBLAY, Érd and G. RONKAY, Budapest); 2 females, Prov. Lao Cai, 4 km SW Cat Cat, 1920 m, February 1998, Frontier (coll. HNHN); 1 male, Prov. Lao Cai, 1800 m, Fan-si-pan Mts, 16 km NW Sa Pa, 16–17.III.1997, leg. L. PEREGOVITS & T. VÁSÁRHELYI (coll. HNHN, Budapest); 1 male, Prov. Lao Cai, Sa Pa, 1500m, 11–17.V.1995, leg. M. OWADA (NSMT, Tokyo).

Slide No. RL6214 (female).

Diagnosis: the external appearance of the new species shows a transitional stage between *Actinotia radios*a (ESPER, [1804]) and *Chloantha hyperici* ([DENIS et SCHIFFERMÜLLER], 1775), resembling more the latter species by its stronger body, more elongate, narrower, dark greyish forewings and pale hindwings without sharply defined dark marginal area and discal spot. However, the configuration of the genitalia displays its closer relationship with the former species, *A. radios*a. The genitalia of both sexes of the new species (Figs 90–91) show conspicuous differences compared with those of the other known species of *Actinotia* HÜBNER, [1821] and *Chloantha* BOISDUVAL, RAMBUR et GRASLIN, [1836] (see BOURSIN 1968, FIBIGER 1997). The genitalia of the closest relative, *A. radios*a are also rather strongly dissimilar but the homologous parts of the male genitalia (e.g. the bifurcate ampullar process, the longer, stick-like harpe, the small cucullus with reduced corona, the sclerotized fultura superior, the ventral process of the carina and the bifurcate basal diverticulum of the vesica) are easily recognizable. In the female genitalia the ovipositor and the ductus bursae are much shorter in case of the new species while the ostial plate and the cervix bursae are considerably larger than in *A. radios*a and the corpus bursae has four long, ribbon-like signa which are absent in the other *Actinotia* species.

A. stevenswani resembles slightly also to *Nedra ramosula* (GUENÉE, 1841), a member of the Nearctic (and partly Neotropical) sibling genus of *Chloantha*, but the details of the forewing pattern and the male genitalia are rather dissimilar.

Description: wingspan 27–31 mm, length of forewing 12–14 mm. Male. Head and thorax ashy grey, collar and tegulae marked with sharp blackish brown stripes. Palpi short, more or less porrect, antenna filiform, medial crest of thorax strong, metathoracic tuft large, ash-grey with blackish tip. Abdomen grey with whitish and reddish-brown hairs; dorsal crest conspicuous, blackish. Forewing relatively short, broad triangular with apex pointed, outer margin finely crenulate. Ground colour pale, shining ashy grey, lower half of basal area, medial field and tornal part dark, covered with dark chocolate-brown and deep red-brown. Streaks of submedian and anal folds strong, long, black, defined with white stripes above. Ante- and postmedial crosslines rather indistinct, fine, strongly sinuous, brownish, with a few blackish dots on veins. Orbicular stigma small, flattened, encircled with blackish, reniform large, elliptical, incompletely encircled with silvery

white, filled with grey and red-brown, outline of stigma continuing in fine white streak between veins m2–m3; claviform absent. Subterminal obsolete, marginal area with fine black streaks between veins. Terminal line fine, dark brown, more or less continuous, cilia dark brown, spotted with white and pale grey. Hindwing shining whitish, veins covered with brown, marginal suffusion diffuse, weak. Discal spot and transverse line poorly visible, latter represented by a row of tiny dots on veins. Terminal line dark brown, cilia whitish with brown inner line. Underside of forewing dark grey irrorated with reddish brown, that of hindwing whitish, costal margin widely irrorated with red-brown and grey. Discal spots and crosslines present but diffuse on both wings. Female. Similar to male, forewing somewhat darker, marginal suffusion of hindwing stronger, broader.

Male genitalia (Fig. 90): uncus long, slender, curved, tegumen high, narrow, penicular lobes long, narrow, setose. Fultura inferior broad, sclerotized, pear-shaped with deep apical incision, fultura superior also sclerotized, broadly X-shaped; vinculum short, strong, V-shaped. Valva elongate, rather broad with parallel margins, curved at apical third, cucullus small, rounded triangular, hairy, with short, weak corona, pointed apex and acute, short pollex. Sacculi asymmetrical, larger, broader on right side, clavi represented by setose slightly crenulate surfaces, stronger on left side, with small medial process which absent on right sacculus. Distal saccular extensions small, rounded, lobate, slightly asymmetrical, larger on right side. Harpe broad-based, erect part long, slender, sclerotized, roughly S-shaped, ampulla bifurcate, dorsal arm shorter but stronger, with apex rounded, ventral arm longer, acute, reaching tip of pollex. Aedeagus medium-long, tubular, finely arcuate, carina with long, sclerotized, thorn-like ventral process and with two stronger dorso-lateral bars. Vesica broadly tubular, membranous with fine scobination, everted forward, recurved ventrally. Basal part with long, ventro-lateral, apically bifurcate diverticulum, both arms bearing small apical cornutus, medial part with larger ventral and smaller dorsal diverticulum, terminal part tapering, tubular, hyaline.

Female genitalia (Fig. 91): ovipositor medium-long, rather weak, posterior papillae anales rounded; gonapophyses slender, fine. Ventral plate of ostium bursae large, cordiform, sclerotized, with stronger inner ring, dorsal plate small, quadrate-trapezoidal, granulose, sternite VIII broad, very strong, with narrow, deep medial incision with sclerotized margins, attached firmly to tip of ventral plate of ostium. Ductus bursae short, rather narrow, flattened, proximal half membranous, wrinkled, distal half sclerotized, quadratic. Cervix bursae elongate, apically semiglobular, membranous with fine wrinkles, corpus bursae elliptical-sacculiform, with four long, ribbon-like signa.

Bionomics and distribution. The species is characteristic of the higher forest regions of the Fan-si-pan Mts. It has at least two generations, at the springtime (March–May) and from the early autumn to the early winter (end of August–December). The overwhelming majority of the specimens was collected by light but a freshly emerged male (the holotype) was observed feeding on sugar bait in November, 1997.

Etymology: the new species is dedicated to Mr STEVEN SWAN, Frontier-Vietnam research staff in 1997 and 1998.

The *Diphtherocome chrysochlora* species-group

- *chrysochlora* (HAMPSON, 1898)
- *impectinata* sp. n.
- *autumnalis* (B.S. CHANG, 1991)
- *chloronympha* sp. n.
- *thaumasia* (HREBLAY et RONKAY, 1898), **comb. nov.**

For details of the taxonomy of the genus *Diphtherocome* WARREN, 1907, see HREBLAY & RONKAY (1998).

***Diphtherocome impectinata* sp. n.**

(Figs 92–95, 163)

Holotype: male, "VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 29.XI.1997, leg. L. Peregovits & L. Ronkay" (coll. HNHM, Budapest). Slide No. RL6061.

Paratypes: 16 males, 15 females, from the same locality, 29.XI., 4–6., 8.XII. 1997; 1 male, 1 female, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. PEREGOVITS & L. RONKAY (HNHM, Budapest and BMNH, London, M. HREBLAY, Érd and G. RONKAY, Budapest).

Slide Nos RL6085 (male), RL6189, RL6191 (females).

Diagnosis: the new species is confusingly similar externally to its allopatric sister species, *Diphtherocome chrysochlora* (HAMPSON, 1898). The main differences between them can be found in the pectination of the male antenna and the shape and size of the last abdominal sternite. The pectination of the male antenna of *D. impectinata* is considerably shorter, the branches being almost half as short as in *D. chrysochlora* and extend only to the end of medial third of the antenna, the apical third is filiform, in *D. chrysochlora*, only the last fifth of the axis is filiform. The last abdominal sternite of the females of the new species is narrower and longer with deeper caudal incision, than in *D. chrysochlora*. In the male genitalia of *D. impectinata* (Figs 92–93) the distal part of the valva is narrower, strongly tapering into an acute apex, the cucullus has no deeper ventral incision at base of harpe as in *D. chrysochlora* (see YOSHIMOTO 1994, Fig. 477).

The female genitalia of *D. impectinata* and *D. chrysochlora* are very similar but differ in the shape of the caudal incision of the ostium which is narrower, more sharply defined, regularly lyriform in *D. impectinata* (Figs 94–95), more diffuse, broader, more calyculate in *D. chrysochlora* (Figs 96–97); the ductus bursae of the new species is somewhat longer, broader with stronger sclerotization.

Description: wingspan 28–34 mm, length of forewing 12–16 mm. Male. Head and thorax dark mossy green mixed with grey-brown and a few ochreous hairs, frons smooth, palpi short, slen-

der, upturned, vertex with well-developed tufts. Antenna shortly bipectinate, pectination extending to the end of medial third of axis. Collar unicolorous green, metathoracic tuft large, green marked with brownish. Abdomen short, reddish-brown, with lateral ridges and a large tuft on second segment; ventral side pale greenish. Forewing elongate, rather narrow triangular with apex acute, outer margin crenulate with triangular, pointed lobe at vein m3. Ground colour dark, shining mossy green (fading rapidly to ochreous), basal field, cell and inner part of marginal area suffused, costal area spotted with dark greyish brown. Ante- and postmedial crosslines double, strongly sinuous, former often more obsolete, filled with whitish, latter regularly sharply defined, broad, filled with greyish. Orbicular and reniform stigmata relatively large, former rounded triangular, latter hour-glass-shaped, both incompletely encircled with whitish green, filled with greenish and darker brown. Cell marked with darker greenish-grey spot between stigmata, claviform represented by small blackish arch. Subterminal rather conspicuous, more or less continuous, sinuous, wide white(ish) stripe, the palest marking of wing. Terminal line a row of fine black arches, cilia as ground colour. Hindwing dark greyish brown, marginal area somewhat darker, discal spot and transverse line present but usually diffuse. Terminal line fine, black(ish), cilia greenish, spotted with grey-brown. Underside of wings pale, shining ochreous-greenish, inner area of forewing strongly other parts of wings sparsely irrorated with dark blackish grey. Discal spots and transverse lines regularly present but diffuse, dark brown or blackish-grey. Female. Similar to male, but antenna filiform, last abdominal segment thickened, rather long.

Male genitalia (Figs 92–93): uncus short, strong, with fine medial crest dorsally, apex hooked. Tegumen narrow, high, peniclar lobes narrow, fultura inferior sclerotized, broad, cordiform with quadrangular apical plate; vinculum short, slender, V-shaped. Valva elongate, distal half tapering, cucullus small, triangular with apex pointed, corona reduced. Sacculus very long, narrow, clavus represented by narrow, setose surface, harpe short, strong, flattened, hockey-stick-shaped, ampulla reduced to its basal plate, costal area with large hairy field above ampulla. Aedeagus long, cylindrical, carina with long, flattened, apically rounded ventro-lateral bar. Vesica membranous, everted forward, bent ventrally, basal half inflated, more or less globular, with two small membranous diverticula situated laterally sides, each armed with a few short spinules, ventral side with large spinulose field terminad, covered densely with fine spiculi.

Female genitalia (Figs 94–95): ovipositor short, weak, gonapophyses slender, fine. Ostium bursae large, flattened, sclerotized, quadratic-trapezoidal, lateral margins upturned, only slightly converging towards proximal end, caudal edge with deep, lyriform medial incision. Ductus bursae short, flattened, granulose-scobinate, with sclerotized folds. Cervix bursae large, rounded, strongly scobinate, ribbed variably strongly, corpus bursae large, elliptical-sacculiform, membranous with fine wrinkles and scobination; without signa but with finely wrinkled area at fundus, consisting of concentric rings of wrinkles.

***Diphtherocome bryochlora* sp. n.**

(Figs 98–99, 164–165)

Holotype: male, "VIETNAM, Prov. Lao Cai, Fan-si-pan Mts, 3 km NW Cat Cat, 2000 m, 1.XII.1997, leg. L. Peregovits & L. Ronkay", slide No. RL6060 (coll. HHNM, Budapest).

Paratypes. Vietnam. 1 male, 17 females, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 29.XI., 4–6.XII.1997, leg. L. PEREGOVITS & L. RONKAY (colls HHNM, Budapest and BMNH, London, M. HREBLAY, Érd and G. RONKAY, Budapest). Nepal. 3 males, Deorali Danda, Tseram, 3900 m, 17.XI.1998, leg. KARMA SHERPA (coll. M. HREBLAY, Érd).

Slide No. HM11551 (male), RL6190 (female).

Diagnosis: the new species belongs to the *Diptherocome chrysochlora* (HAMPSON, 1898) species-group, differing from the related taxa by its much paler, light mossy green forewing ground colour with less intense darker suffusion, especially in the basal area. In addition, it differs from the *D. chrysochlora* – *D. impectinata* species-pair by its finer, narrower crosslines, much larger, lunulate reniform stigma, paler, more greyish hindwing and by the reduction of the white(ish) stripe of the subterminal line; the abdomen of the female also narrower, without strongly dilated last segment. The male genitalia of *D. bryochlora* (Fig. 98) differ from those of the *D. chrysochlora* – *D. impectinata* and the *D. chloronympha* – *thaumasia* species-pairs by its longer uncus, much higher, narrower, quadrangular fultura inferior, significantly longer, more acute cucullus with double-peaked apex, the harpe is more than twice as long, and the vesica is narrower, the cornuti fields are considerably smaller. In the male genitalia of the another related species, *D. autumnalis* (B. S. CHANG, 1991) the valva is much broader, triple-peaked distally, the harpe is shorter, apically more curved, the cornuti fields of the vesica are smaller than in *D. bryochlora*. The female genitalia of the new species (Fig. 99) differ from those of all closely related species by its broader, caudally not incised ostium bursae. In addition, the ductus bursae is longer than those of *D. chrysochlora*, *D. impectinata* and *D. autumnalis*, its sclerotization is stronger and the corpus bursae is shorter, more rounded. The ductus and the corpus bursae of *D. thaumasia* (Fig. 102) are rather similar in shape and size to those of *D. bryochlora* but the ductus bursae of *D. thaumasia* is stronger, not constricted at middle, the cervix is narrower, higher, with stronger sclerotization and the corpus is shorter, more rounded.

Description: wingspan 29–33 mm, length of forewing 12–14 mm. Male. Head and thorax pale, ochreous mossy green mixed with some brownish and a few ochreous hairs. Frons smooth, palpi very short, slender, slightly upturned. Antenna rather shortly bipectinate to apical quarter of axis. Collar unicolorous green, metathoracic tuft large, greenish-ochreous. Abdomen short, ochreous brown, with lateral ridges and small tuft on second segment. Forewing elongate, relatively narrow triangular with apex pointed, outer margin strongly crenulate with small lobe at vein m3. Ground colour pale, shining mossy green (fading rapidly to ochreous), with some golden-ochreous irroration, lower third of basal field, upper half of medial area and inner part of marginal zone suffused with golden-brown; costal area spotted with darker brown. Ante- and postmedial crosslines double, strongly sinuous, fine, dark greenish-brown, filled with silvery-whitish. Orbicular and reniform stigmata sharply defined, former small, rounded, latter much larger, lunulate, both encircled with silvery-whitish, filled with greenish and darker brown; claviform represented by pale, whitish-greenish arch. Subterminal rather indistinct, usually represented by interrupted, diffuse whitish line. Terminal line a row of fine greenish arches defined by whitish scales, cilia as ground colour. Hindwing finely transparent, shining ochreous white irrorated with greyish, marginal suffusion and veins darker. Discal spot and transverse line present but most often diffuse. Terminal line fine, greenish, cilia greenish with darker inner line, fringes of inner margin brownish-ochreous. Under-side of wings pale, shining greenish-ochreous, sparsely irrorated with dark blackish grey. Traces of stigmata on forewing usually recognizable, discal spot of hindwing and transverse lines of both wings regularly present but diffuse, dark brown or blackish-grey. Female. Similar to male, but antenna filiform.

Male genitalia (Fig. 98): uncus medium-long, rather slender, with fine medial crest dorsally, apex hooked. Tegumen narrow, high, penicular lobes narrow, fultura inferior sclerotized, high quadrangular; vinculum short, strong, V-shaped. Valva elongate, distal half tapering, cucullus small, acute triangular with fine, double-peaked apex; corona reduced. Saccus very long, narrow, clavus represented by setose surface, harpe long, strong, slender, more or less S-shaped, with apex acute, costal area densely hairy. Aedeagus long, cylindrical, carina with long, flattened ventral plate. Vesica membranous, broadly tubular, everted forward, recurved ventrally. Basal part tubular, scobinate, medial part inflated, more or less globular, with large field of strong spinules on rather long lateral diverticulum and with smaller field of short but strong spinuli terminad.

Female genitalia (Fig. 99): ovipositor short, weak, gonapophyses slender, fine; sternite VIII forming broad, U-shaped sclerotized half-ring. Ostium bursae large, flattened, sclerotized, trapezoidal-quadratic, ductus bursae rather long, flattened, partly sclerotized, partly granulose-scobinate, with long sclerotized ribs, medial part constricted, proximal part strongly dilated. Cervix bursae small, rounded-conical, scobinate and wrinkled, corpus bursae discoidal-ovoid, membranous, with two rounded, finely wrinkled diverticula (a basal and an apical).

***Diphtherocome chloronympha* sp. n.**

(Figs 100, 166)

Holotype: male, "NEPAL, Koshi, Terhathum area, Tinjure Phedi, 2900 m, 87°27'E, 27°12'N, 18.X.1996, leg. Gy. M. László and G. Ronkay", slide No. RL5845 (coll. G. RONKAY, Budapest).

Paratype: 1 female, East Nepal, Deorali Danda, Tseram, 3900 m, 17.XI.1998, leg. KARMA SHERPA (coll. M. HREBLAY, Érd).

Slide No. HM11552 (female).

Diagnosis. *D. chloronympha* is the sister species of *D. thaumasia*. It is easily distinguishable from its close relative by its bright emerald-green ground colour and sharply defined, fine black forewing pattern, while the ground colour of *D. thaumasia* is bluish-grey or violaceous with green(ish) and black markings. The male genitalia of the two species are similar in type, differing in a number of features: the fultura inferior of *D. chloronympha* (Fig. 100) is broader, the apex of valva is shorter, less acute, the pollex-like lobe is smaller, more rounded, the harpe is shorter, less pointed and the large cornuti field of the vesica is larger, consisting of longer, finer spinules.

The new species differ from the externally somewhat similar *D. metaphaea* (HAMPSON, 1908) by its serrated, not pectinated male antenna, darker, deeper green forewing with more sharply defined black and white crosslines and outlines of stigmata, much strongly sinuous postmedial line with a sharp black streak running to cilia at middle, conspicuously darker hindwing, etc.

The valvae of *D. chloronympha* and *D. thaumasia* (Figs 100–101) are longer, narrower with more parallel margins, the apical process is much stronger, the pollex-like lobe is larger, more prominent, than in case of the *D. chrysochloa*-*D. impectinata* species pair, the harpe is longer, more or less straight, apically



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Figs 139–146. 139–140 = *Agrochola karma* sp. n., 139 = holotype, 140 = paratype, male; 141 = *A. semirena* (DRAUDT), syntype, female, China; 142 = *A. plumbitincta* sp. n., holotype; 143 = *Hemiglaea costalis leptotaenia* ssp. n., holotype; 144 = *H. ionea* sp. n., holotype; 145 = *Rhynchaglaea discoidea* sp. n., holotype; 146 = *Owadaglaea reticulata* sp. n., holotype



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Figs 147–154. 147 = *Elwesia macrophthalma* sp. n., holotype; 148 = *E. vuquangconi* sp. n., holotype; 149 = *Elwesia tarka sericea* ssp. n., holotype; 150 = *E. diplostigma* HAMPSON, male, Nepal; 151 = *E. diplostigma vasarhelyii* ssp. n., holotype; 152–153 = *Hyalobole subtropica* sp. n., paratypes; 154 = *Xanthia glaucozona* sp. n., holotype

not recurved, the fultura inferior is broader, the cornuti fields of the vesica are smaller.

The female genitalia of *D. thaumasia* (Fig. 102) have longer, narrower ostium and ductus bursae and smaller, more rounded, elliptical-discoidal corpus bursae than those of the *D. chrysoclora*-*D. impectinata* species pair.

Description. Wingspan 32 mm, length of forewing 15 mm. Male. Head and thorax deep emerald-green, palpi very short, slender, slightly upturned, laterally brownish, tips ochreous. Basal half of antenna shortly biserrate, distal part ciliate. Forewing elongate, relatively narrow triangular with apex pointed, outer margin slightly sinuous. Ground colour vivid, unicolorous, deep emerald-green, crosslines and outlines of stigmata sharply defined. Subbasal line short, straight, ante- and postmedial crosslines strongly sinuous, fine, whitish and blackish brown, defined by broad, dark brownish zones; medial line diffuse, broad, shadow-like. Orbicular and reniform stigmata large, more or less rounded, encircled with fine whitish and blackish-brown lines, filled with ground colour; claviform represented by its double, white and black apical arch. Subterminal deleted, terminal line dark green, cilia as ground colour. Hindwing dark grey-brown, wide marginal area somewhat darker, transverse line and discal spot hardly visible. Terminal line fine, dark brown, cilia greenish, spotted with brown. Underside of wings pale greenish, inner part of forewing and marginal area of hindwing strongly suffused, other parts of wings irrorated with dark brown. Discal spots and transverse lines present but diffuse, dark brown. Female unknown.

Male genitalia (Fig. 100): uncus very short, strong, densely hairy, with fine medial crest dorsally, apex hooked. Tegumen narrow, high, fultura inferior sclerotized, broad, basal plate more or less cordiform, apical part quadratic; vinculum short, strong, V-shaped. Valva long, narrow, margins almost parallel, cucullus very small, sclerotized, triangular with apex pointed, ventral margin producing rounded, pollex-like lobe below cucullus; corona reduced. Sacculus long, sclerotized, harpe short, strong, hockey-stick-shaped, with sclerotized, flattened basal plate; costal area with large hairy field at place of pulvillus. Aedeagus medium-long, cylindrical, carina with long, flattened, apically rounded ventro-lateral plate. Vesica membranous with fine scobination, everted forward, broadly tubular, medial part with conical diverticulum dorsally, terminating in small bundle of short but strong spinules, terminal third with large spinulose field laterally, consisting of rather short, strong spinules.

Diphtherocome thaumasia (HREBLAY et RONKAY, 1998), comb. n.
(Figs 101–102, 167–168)

Type material examined: holotype female, "Nepal, Annapurna Himal, vic. of Lumle, 1700–2100 m, 5–12.XII.1995, leg. Ganesh Gurung", slide No. RL5645 (coll. G. RONKAY, Budapest).

Additional material examined: 1 male, Nepal, Koshi, Terhathum area, above Gorja, Tshisopani, 2600 m, 87°37'E, 27°21'N, 5.XI.1996, leg. GY.M. LÁSZLÓ and G. RONKAY (coll. G. RONKAY, Budapest).

Slide No. RL5846 (male).

Description of the male. Wingspan 29 mm, length of forewing 13.5 mm. Similar to female but generally darker in colouration, forewing ground colour dark violaceous grey suffused with some chocolate-brown, medial area with brilliant green patches along crosslines and below cell; marginal area somewhat paler greyish. Hindwing and underside of both wings also conspicuously darker, concolorous blackish brown, only apical part of forewing underside irrorated with pale greenish. Antenna shortly biserrate.

Male genitalia (Fig. 101): uncus very short, strong, densely hairy, with fine medial crest dorsally, apex hooked. Tegumen narrow, high, fultura inferior sclerotized, basal plate cordiform, apical

part quadrangular with fine medial incision; vinculum short, strong, V-shaped. Valva long, narrow, with parallel margins, cucullus sclerotized, thorn-like, ventral margin producing an acute triangular, pollex-like lobe below cucullus; corona reduced. Sacculus long, sclerotized, harpe rather long, strong, acute, spine-like; costal area with large hairy field at place of pulvillus. Aedeagus medium-long, cylindrical, carina with rather short, flattened, apically rounded ventro-lateral plate. Vesica membranous, broadly tubular, dorsal surface finely scobinate basally, medial part with conical dorsal diverticulum terminated in small bundle of short but strong spinules and with small, semiglobular ventral diverticulum armed with a few fine spiculi; lateral spinulose field rounded, consisting of rather short, strong, broad-based spinules.

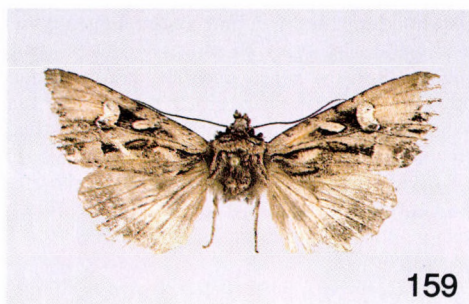
Bionomics and distribution. The two known specimens of the species were found in two rather remote areas of the Nepal Himalaya, at the beginning of the winter, in medium-high deciduous forests.

The *Amphipyra cupreipennis* species-group

The *A. cupreipennis* species-group has long been considered as monotypical until the second species, *A. fuscusa* was described in 1991. Subsequent studies on large materials from the Himalayan region revealed the fact that this group contains three, externally often confusingly similar species belonging to two parallel lines, the configuration of the male genitalia of these two lines are surprisingly different. In addition, as the two syntypes of *A. cupreipennis* were not conspecific and both females the correct pairing of the males and females has been problematic. The lectotype of *A. cupreipennis* was designated by HREBLAY and RONKAY (1998).

The *A. owadai* line is smaller in size with longer, narrower forewings and somewhat stronger medial and postmedial crosslines and the hindwing is also darker, less bright. The asymmetry of the male genitalia (Figs 103–106) is much less expressed, the valvae are generally smaller, the sacculi are narrower, longer with well-developed, horn-like saccular extensions, the terminal folded-cristate lamina of the vesica is stronger, more separated from the medial cornuti field.

The species of the *A. cupreipennis* line are larger, more broad-winged with more concolorous fore- and hindwings, the crosslines of the forewing are absent or diffuse, the marginal area of the hindwing underside is not darkened, the ground colour is brighter rufous. The male genitalia are much more asymmetrical, the right valva is considerably, often twice as large as the left one, the sacculi are flattened, with shorter, lobate extensions, the distal, cristate-folded lamina of the vesica is a direct continuation of the basal parts of the last cornuti of the medial cornuti field.



Figs 155–162. 155 = *Mniotype chlorobesa* sp. n., holotype; 156 = *M. mucronata* (MOORE), male, Nepal; 157 = *M. csanadii* sp. n., holotype; 158 = *Apamea erythrographa* sp. n., holotype; 159 = *A. nigrostris* sp. n., holotype; 160–161 = *Chandata maminti* sp. n., 160 = paratype male; 161 = holotype; 162 = *Actinotia stevenswani* sp. n., holotype



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Figs 163–170. 163 = *Diphtherocome impectinata* sp. n., holotype; 164 = *D. bryochlora* sp. n., holotype; 165 = *D. bryochlora* sp. n., paratype, female; 166 = *D. chloronympha* sp. n., holotype; 167–168 = *D. thaumasia* (HREBLAY et RONKAY), 167 = male, Nepal, 168 = holotype; 169 = *Amphipyra owadai* sp. n., holotype; 170 = *A. owadai nepalensis* ssp. n., holotype

A. owadai – line

- *A. owadai* sp. n. (Vietnam)
- *A. owadai nepalensis* ssp. n. (W Nepal)

A. cupreipennis – line

- *A. cupreipennis* (MOORE, 1882) (Sikkim, E Nepal)
- *A. fuscusa* B. S. CHANG, 1991 (Taiwan)

Amphipyra owadai* sp. n.**Amphipyra owadai owadai* ssp. n.**
(Figs 103–104, 169)

Holotype: male, “VIETNAM, Prov. Lao Cai, 1900–2000 m, Fan-si-pan Mts, 14 km NW Sa Pa, 103°46,06'E, 22°20,9'N, 4–6.XII.1997, leg. L. Peregovits & L. Ronkay” (coll. HNHN, Budapest). Slide No. RL6064.

Paratypes: 2 males, 1 female, with the same data as the holotype (coll. HNHN, M. HREBLAY, Érd, and G. RONKAY, Budapest).

Slide Nos HM10491 (male), RL6215 (female).

Diagnosis: the new species differs externally from members of the *cupreipennis*-line by its smaller size, narrower forewings, diffuse but well-discernible medial stripe and finer, stronger postmedial line, the wide outer part of the marginal area is darker than the other part of the wing, the ground colour of the hindwing is darker, less bright reddish-rufous and the marginal area of the hindwing underside is considerably darker reddish brown than the basal part of the wing, the blackish costal stripe is paler, more diffuse. The comparison of the genitalia with those of the related species are given in the characterization of the two lineages of the species-group.

The new species is represented by two geographic subspecies, their differences are discussed under *A. owadai nepalensis*.

Description: wingspan 61–63 mm, length of forewing 29–30 mm. Sexes similar. Head and thorax shining blackish-brown, mixed with a few brownish and ochreous hair-scales, abdomen somewhat paler, without ochreous intersegmental ridges. Forewing elongate, rather narrow, apex finely rounded, ground colour blackish brown with intense violaceous or bronze sheen. Antemedial line poorly visible but present as darker shadow, medial line broad, dark stripe with stronger dark patch at place of reniform, postmedial rather strong, narrow, slightly sinuous, defined by finely lighter greyish outer stripe; orbicular stigma absent. Hindwing bright, dark rufous-brown, costal part and cilia dark grey-brown. Underside of forewing shining blackish-grey, somewhat darker between veins, hindwing dark ochreous-rufous with broad reddish brown marginal and diffuse, dark blackish-grey costal suffusion; discal spot may present as diffuse, large brownish patch.

Male genitalia (Figs 103–104): uncus long, thick, medially only slightly dilated, apical part with small, rounded, dorsal hump; apex hooked. Tegumen rather high, narrow, penicular surfaces long, narrow; anal tube with rather strong sclerotization on both dorsal and ventral surfaces. Fultura

inferior large, sclerotized, pentagonal, with two medio-lateral folds producing long transverse crests; vinculum strong, long, V-shaped. Valvae broad, relatively short, sclerotized, only slightly asymmetrical, broader, higher on right side. Costal margin with small, triangular subapical lobe, costal area densely hairy; apex rounded, cucullus with a few long hair-pencils. Sacculi asymmetrical, long, narrow, heavily sclerotized, distal extension considerably longer, stronger, hooked on right side, that of left sacculus short, slightly curved, apically rounded. Clavi also slightly asymmetrical, rounded triangular lobes, producing more pointed, setose peak on right sacculus; harpe reduced. Aedeagus short, cylindrical, distal half considerably thicker, ventro-lateral edge of carina forming bill-like process on left side while the right side is membranous-scobinate, terminating in a row of strong but small teeth ventrally. Vesica spacious, everted forward, recurved laterally to right side. Basal part membranous, with a row of shorter cornuti apically, medial part with large ventro-lateral field of long, strong, pin-like, bulbed cornuti and sclerotized-wrinkled plate. Terminal part strongly tapering, armed with heavily sclerotized, strongly folded and cristate lateral lamina.

Female genitalia: ovipositor medium-long, conical, posterior papillae elongate, pointed; gonapophyses rather strong. Ostium bursae small, rounded quadrangular, finely sclerotized, dorsal plate stronger, bearing short, pointed medial peak ("ligula"). Ductus bursae long, membranous, with fine crests and wrinkles, posterior third narrowly tubular, medial third about twice as broad, proximal third strongly dilated. Bursa copulatrix very large, membranous-ribbed, ovoid-cordiform sac, cervical part with ductus seminalis originating from apical third on left side; signa absent.

Etymology: the new species is named after Dr. MAMORU OWADA, the dedicated specialist of Noctuidae and other Heterocerans, who has revised several eastern Pacific groups of the genus *Amphipyra*.

***Amphipyra owadai nepalensis* ssp. n.**

(Figs 105–106, 170)

Holotype: male, "WEST-NEPAL, 11 km N of Dailekh, 2350 m, 23.I.1998, leg. Karma Sherpa", slide No. HM11011 (coll. HREBLAY, Érd).

Paratypes: 1 female, W Nepal, 20 km N of Dailekh, 3000 m, 20.I.1998, leg. KARMA SHERPA; 1 male, E Nepal, Surke Danda, 4 km NE of Suketar, Lali Kharka, 2350 m, 9.V.1997, leg. M. HREBLAY & L. SZÉCSÉNYI (coll. HREBLAY).

Slide Nos HM9963 (male), HM11012 (female).



Fig. 171. Male genitalia of *Nyctycia plumbeomarginata* (HAMPSON), holotype, Burma

Diagnosis. The west Nepalese subspecies of *A. owadai* differs from the typical population occurring in North Vietnam by its smaller size (wingspan 53–59 mm, length of forewing 26–28 mm), darker forewing colouration with less expressed medial and postmedial crosslines and somewhat paler ground colour of hindwing, the dark marginal suffusion of the hindwing underside is also less prominent. The male genitalia of the two races differ slightly in the shape of the valvae and the ventral saccular extensions, which are somewhat longer, narrower in the Nepalese subspecies.

* * *

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SPECIES-SPECIFIC DISTRIBUTION OF REED-NESTING PASSERINE BIRDS ACROSS REED-BED EDGES: EFFECTS OF SPATIAL SCALE AND EDGE TYPE

BÁLDI, A. and T. KISBENEDEK

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We studied the distribution of breeding passerine birds across reedbed edges in Hungary. Our aim was to investigate the effects of edge. Therefore, we studied the birds' distribution at two spatial scales, across four different reed edges (a reed – water edge, a reed – boat path edge, a reed with bushes – dike edge and a gradually changing edge), where the vegetation structure and the landscape position (depending on the extent of open water) were different. Reed-nesting birds were censused by the line transect method in three wetlands (Lake Velence: 1992–1994; Kis-Balaton: 1991; Macska-sziget (island), Szigetköz: 1994–1995). We found different edge effects at different spatial scales. At the landscape scale there were no differences at the community level between edge and interior community structure parameters (species number, total and species density), but at the species level, the density of Bluethroat *Luscinia svecica* was 3.5 times higher in the interior than in the edge habitat, whereas the density of Great Reed Warbler *Acrocephalus arundinaceus* was 12 times higher in the edge than in the interior habitat. At the local scale, when only the first 40 m from the edge was considered, the Reed Warbler *A. scirpaceus*, Savi's Warbler *Locustella luscinioides*, Bearded Tit *Panurus biarmicus* and partly the Sedge Warbler *A. schoenobaenus* showed strong significant edge (0–5 m) preference for both reed – water and reed – boat path – reed edges. Eight out of 14 species showed different patterns of edge avoidance/preference at the three edges of similar landscape position, which reflects the crucial role of vegetation structure at the edge. Reed-nesting passerine species responded individualistically to edges. The general pattern of edge preference on the local spatial scale may be a result of lower nest predation in the edges mediated by the vegetation structure.

Key words: breeding bird communities, edge effect, habitat selection, landscape ecology, reedbed, vegetation structure

INTRODUCTION

The distribution of animals across the junctions of different landscape elements is a key issue of ecology. In addition, the description of edge effects and fragmentation has emerged recently as a critical research area in conservation biology (SOULÉ & KOHM 1989), and ornithology (NEWTON 1995). However, our knowledge is still in its infancy (LIDICKER & KOENIG 1996). It has been suggested that greater wildlife diversity is due to the greater structural complexity of

edge vegetation (YAHNER 1988), via better food availability and concealment. Most of the edge studies on which this is based were conducted at forest edges, and the effects of other edges on bird distributions generally have been lacking from the literature (ROSENBERG & RAPHAEL 1986, MURCIA 1995). Although TSCHARNTKE (1992) reviewed the effects of fragmentation of reedbeds, he cited only one study dealing with birds. We found only one other paper published recently on fragmentation of reedbeds and the occurrence of birds (CELADA & BOGLIANI 1993).

We define edge effect as the distribution of population and community structure parameters across the edge. The edge is the outer boundary of the reedbed. In our study we used three approaches to detect edge effect: first, the overall patterns were investigated at two spatial scales: the local and the landscape scales (see details in methods). We carried out our study at the two scales that were emphasised by YAHNER (1988) and MOSKÁT *et al.* (1992). Second, reedbed edges in different landscape positions were compared. Third, we compared three reedbed edges with different vegetation structures.

Our main goal was to analyse the distribution of breeding passerine bird species across reedbed edges. We investigated the following questions: (1) are there any differences between edge and interior reed-nesting passerine bird communities? (2) Are there any differences between the distribution of these birds at two levels of spatial scales (landscape and edge levels)? (3) How can the type and landscape position of reed edges influence the distribution of birds across the edge? Finally, as a synthesis of the previous questions, we describe the distribution of individual bird species across a heterogeneous reedbed.

MATERIALS AND METHODS

Breeding passerine birds were censused at three study sites in Western Hungary. Lake Velence (47°10'N 18°32'E) has a reedbed of 1000 ha. The vegetation at this study site was almost entirely reed *Phragmites australis*. We counted birds from a boat within the reedbed along narrow (2–3 m) boat paths (hereafter called interior sharp edges), using a line transect method. The routes for the interior habitats were at least 200–300 m from the edge of the reedbed. Reedbed – water edges (sharp edges) were also surveyed by boat (Fig. 1a). Considering the standard 25+25 m wide belts on both sides of the transect in interior and 25 m wide belt on one side in edge habitats, 15 ha in the former and 12.25 ha in the latter were censused in the breeding seasons of 1992 and 1994. Some parts of the routes (11.5 ha in interior and 4.5 ha in edge habitats) were censused both

in April and May in the same year. For density estimation, we considered only the greater density value of a particular route. The other routes were censused only in May.

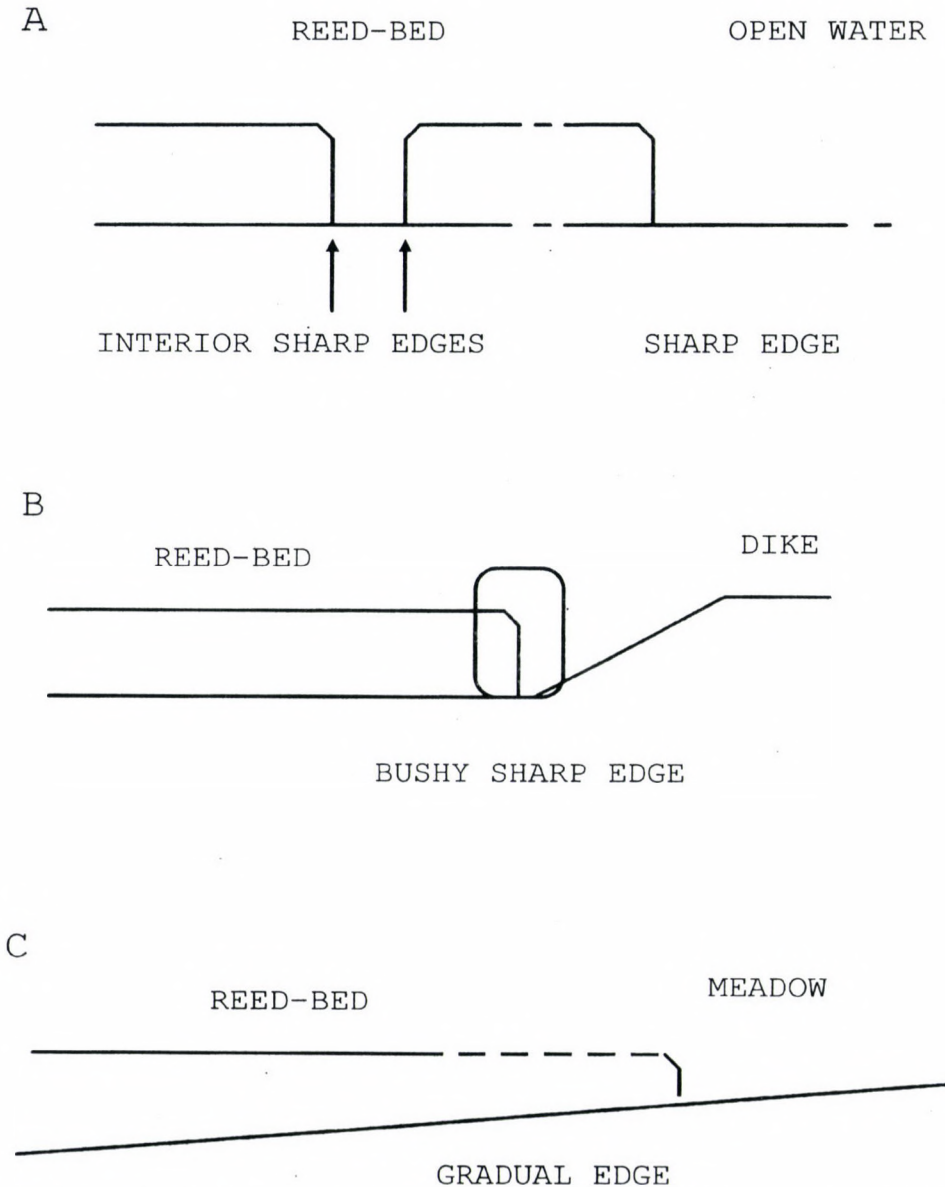


Fig. 1. Different kind of reedbed edges studied: sharp edge, and interior sharp edge at Lake Velence (1a), bushy sharp edge (1b) at Kis-Balaton marshland study areas, and gradual edge at Macska-sziget (1c)

The marsh Kis-Balaton (46°42'N, 17°21'E) is a reconstructed marshland of 15,000 ha in Western Hungary. The area was more heterogeneous than at Lake Velence, consisting of managed (burned or mowed) parts and some bushes within the reedbed, and a planted bush line of willow (*Salix* spp.) and alder (*Alnus* sp.) at the very end of the reedbed, bordering the grassy dike side (hereafter called bushy sharp edge, Fig. 1b). There were small forest patches on the other side of the dike, about 60–100 m away. We conducted bird censuses by the line transect method along the surrounding dikes of the area. The census route was 8.5 km long (21.25 ha, considering a 25m belt from the reedbed edge) but for this comparison we included only the unmanaged reedbeds, covering 7.6 ha. Bird censuses were repeated eight times in April and May, 1991 (see BÁLDI & MOSKÁT (1995) and MOSKÁT & BÁLDI (1999) for details). The data were pooled.

The third study site was situated in the U turn of a dead-branch of the Danube River in the Szigetköz Region, Western Hungary (47°51'N, 17°27'E). The area of the reedbed was ca. 70 ha. We censused 5.5 ha of reedbed edge by the line transect method. The inner part of the U turn formed an island (Macskasziget (island)), which was regularly mowed. The census route was on the edge of unmowed reedbed on the island. The edge was clearly different from the former ones, where there were sharp edges at the end of the reedbeds. At this third site, the ground rose gradually to form a low, sparse reed stand with sedge at the edge, which gradually changed to denser and taller, "healthier" reed stands (hereafter called gradual edge, Fig. 1c). The exact edge of the reedbed was at the end of the mowed parts. There were altogether four censuses: in April and May in 1994 and 1995. The data were pooled.

At all three sites, all birds detected either visually or acoustically were recorded (mainly acoustical records). The lateral distance of each observed bird from the edge was estimated. For the density estimations, which were calculated only for data from Lake Velence, we used only the observations within the standard 25 m wide belts. The data analysis was carried out in three steps. First, the bird communities of interior and edge habitats were compared (the landscape scale), only for data from Lake Velence. Second, we analysed the data on a much finer (local) spatial scale to detect possible differences between different scales. For this purpose, the abundance of birds in relation to the distance from the edge was examined in 5 m zones within the first 40m from the edge at all study sites. This analysis was performed for the interior (interior sharp edges at the boat paths) censuses, as well. Third, the distribution of birds across the sharp and interior sharp edges at Lake Velence were compared with similar data obtained from marshland Kis-Balaton (bushy sharp edge) and Szigetköz (gradual edge), to detect the effects of different edge types.

We used only data from the main belt (<25 m) for comparing bird communities in the edge and interior habitats, where densities of birds (number of in-

dividuals/10 ha) were calculated. Chi-square tests, *t*-tests and G-tests of homogeneity were applied to evaluate the differences in the distribution of birds at the edges of the three study sites.

RESULTS

We observed the same eight passerine bird species in the interior and edge habitats at Lake Velence (Table 1). The total density values of edge and interior habitats were similar: 113.6 individuals/10 ha along the edge, and 102.0 individuals/10 ha in the interior habitats. (Density was simply calculated as the number of observed birds within the main-belt (25 m) and then standardised to number per 10 ha.) The distribution of density values among species, however, significantly differ in the edge and interior habitats (likelihood ratio $\chi^2 = 16.159$, *df* = 7, *p* < 0.05). This is mainly the result of the unequal densities of two species in the edge and interior habitats: the Bluethroat *Luscinia svecica* avoided the edges (ca. 3.5 times larger density in interior habitats), and the Great Reed Warbler *Acrocephalus arundinaceus* preferred the edges (ca. 12 times greater density in the edge). There were no large differences in the other species. The contribution of these two species to the total χ^2 value is ca 75%.

The distribution of the number of individuals in relation to the distance from the edge (0–40 m) showed significant deviation from the homogeneous distribution in the Bearded Tit *Panurus biarmicus*, Great Reed Warbler, Savi's Warbler *Locustella luscinioides*, Reed Warbler *A. scirpaceus* and the Sedge Warbler *A. schoenobaenus* (Fig. 2) at the sharp edge. The Bearded Tit, Great Reed, Savi's and Reed Warblers showed clear preference for the first 5 m of the reedbed. The pattern of Sedge Warbler's distribution fluctuated in relation to the distance from the edge, without clear edge preference. The only species with homogeneous dis-

Table 1. Density of passerine bird species (number of individuals/10 ha) in interior (0–25 m of the interior sharp edge) and edge (0–25 m of the sharp edge) reed-bed habitats at Lake Velence

Species	edge (12.25 ha)	interior (15 ha)
<i>Acrocephalus arundinaceus</i>	8.2	0.7
<i>Acrocephalus melanopogon</i>	2.5	2.0
<i>Acrocephalus schoenobaenus</i>	20.4	15.3
<i>Acrocephalus scirpaceus</i>	28.6	23.3
<i>Emberiza schoeniclus</i>	5.7	4.0
<i>Locustella luscinioides</i>	24.5	30.0
<i>Luscinia svecica</i>	2.5	8.7
<i>Panurus biarmicus</i>	21.2	18.0

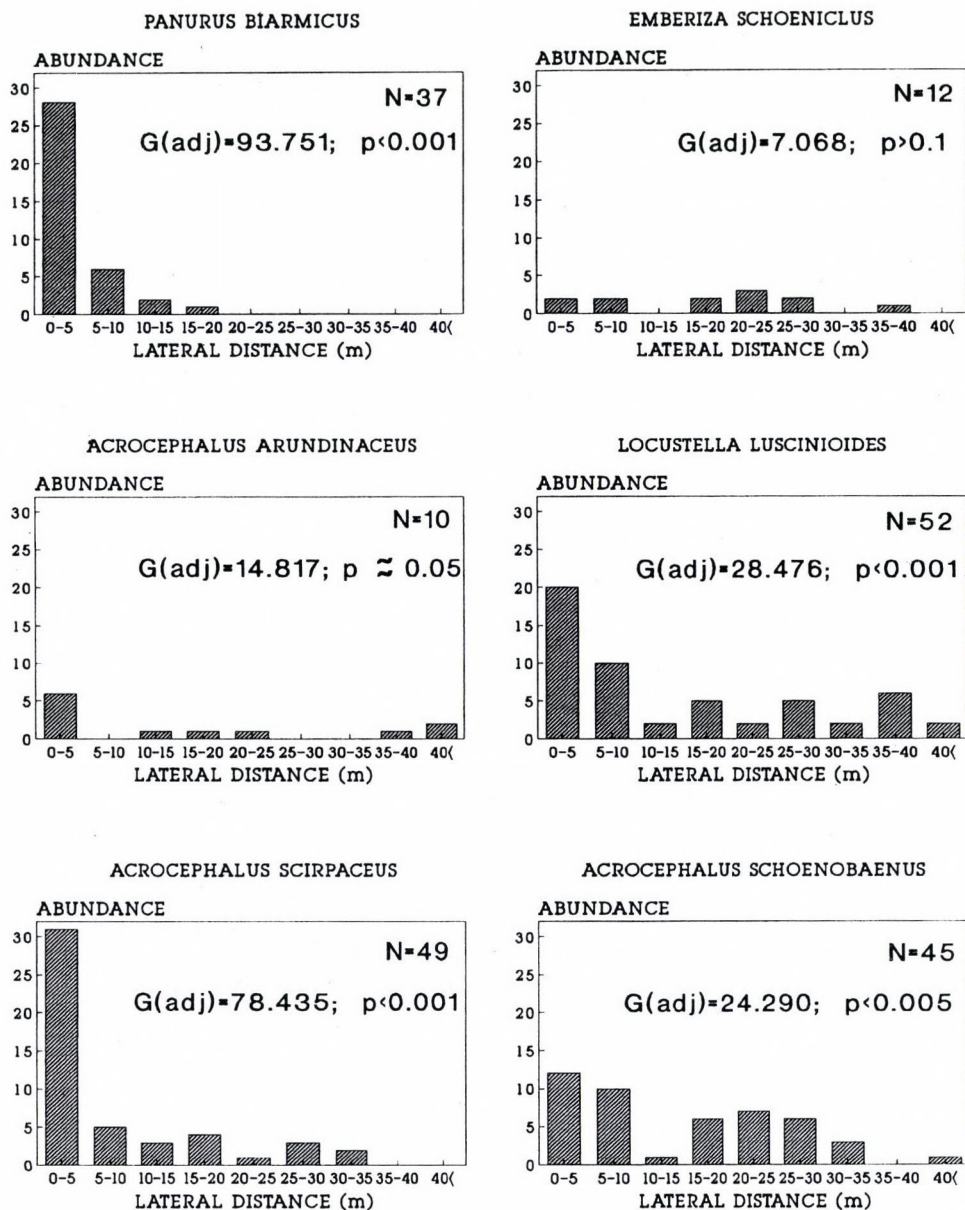


Fig. 2. Distribution of the number of individuals of the six most abundant passerine bird species at Lake Velence across sharp edges. For analysis we used the 0–40 m zone (to which the N refers), but on the figures we presented the number of birds beyond 40 m, because it can give important additional information on the edge preference of species

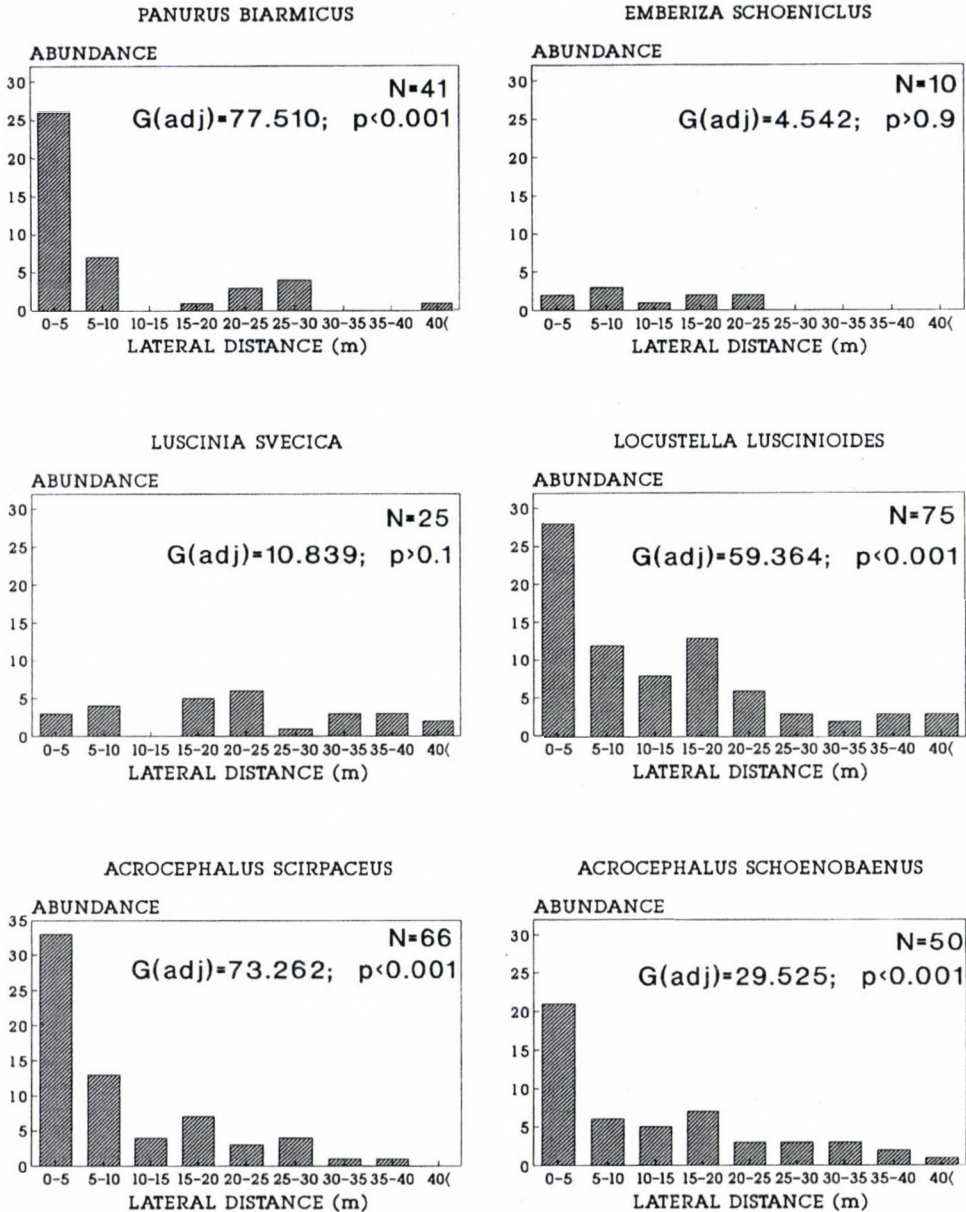


Fig. 3. Distribution of the number of individuals of the six most abundant passerine bird species at Lake Velence across interior sharp edges. For analysis we used the 0–40 m zone (to which the N refers), but on the figures we presented the number of birds beyond 40 m, because it can give important additional information on the edge preference of species

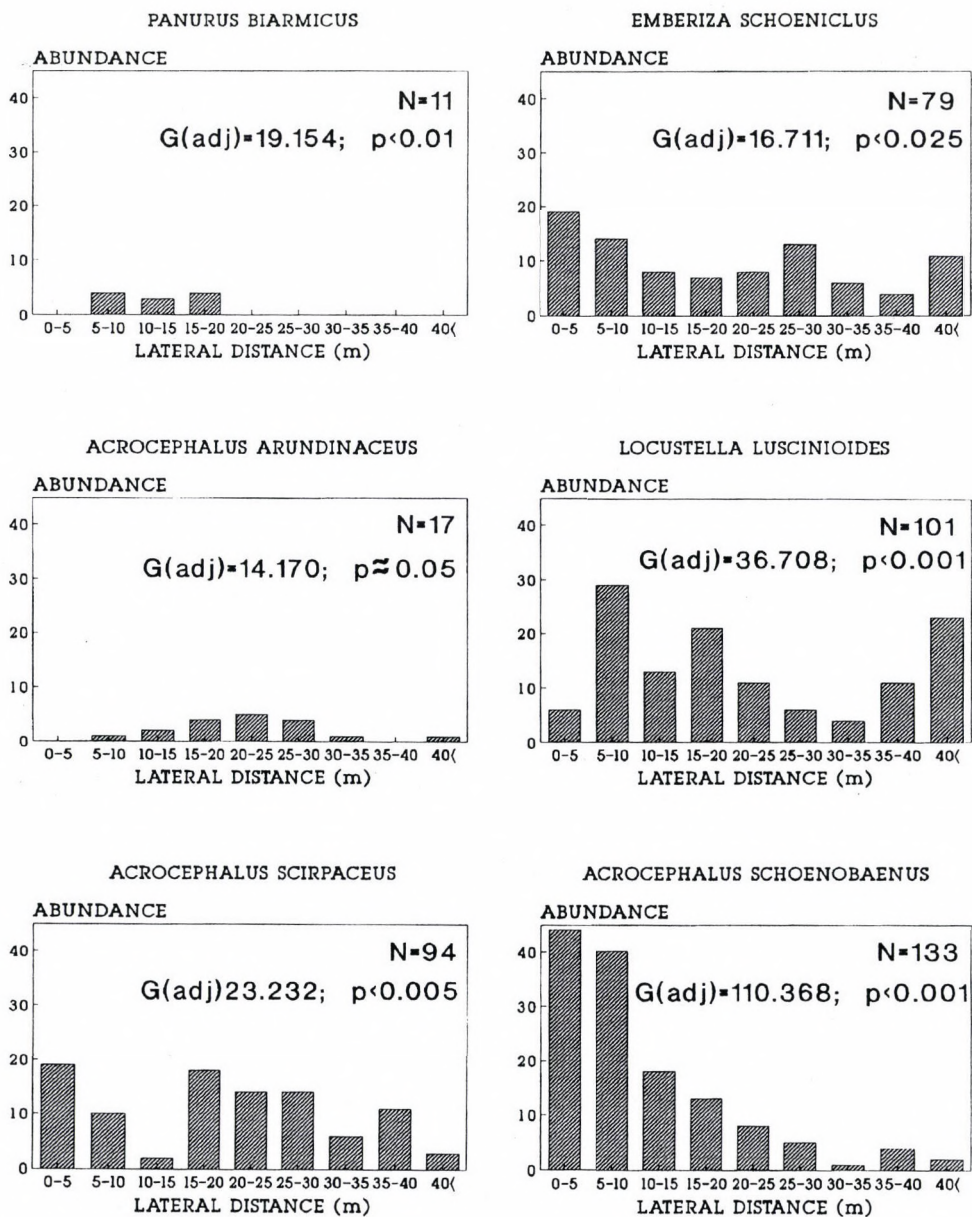


Fig. 4. Distribution of the number of individuals of the six most abundant passerine bird species at Kis-Balaton across bushy sharp edge. For analysis we used the 0–40 m zone (to which the N refers), but on the figures we presented the number of birds beyond 40 m, because it can give important additional information on the edge preference of species

Table 2. Comparison of the distribution of passerine birds across edges in three edge types. (The 5 m wide zones were used, see Figs 2–5) χ^2 values, degree of freedom and two-tailed significances are given. – : too few values at least at one of the sites for calculation

Species	sharp edge – bushy sharp edge	sharp edge – gradual edge	bushy sharp edge – gradual edge
<i>Acrocephalus arundinaceus</i>	17.137 7 $p < 0.05$	–	–
<i>Acrocephalus schoenobaenus</i>	20.814 7 $p < 0.01$	5.806 7 NS ($p > 0.5$)	25.854 7 $p < 0.002$
<i>Acrocephalus scirpaceus</i>	34.273 7 $p < 0.001$	3.727 6 NS ($p > 0.5$)	15.400 7 $p < 0.05$
<i>Emberiza schoeniclus</i>	5.131 7 NS ($p > 0.5$)	7.972 7 NS ($p > 0.1$)	4.140 7 NS ($p > 0.5$)
<i>Locustella luscinioides</i>	30.614 7 $p < 0.001$	19.674 7 $p < 0.02$	21.266 7 $p < 0.01$
<i>Panurus biarmicus</i>	23.092 3 $p < 0.01$	–	–

tribution was the Reed Bunting *Emberiza schoeniclus*. Therefore, four from the six abundant species occurred mostly in the first 5 m of the reedbed, showing a well defined overall edge preference at the local scale. Very similar patterns were observed for the five common species in the interior sharp edge habitats, where the censuses were made along narrow boat paths, no wider than 2–3 m (Fig. 3). The Bluethroat *Luscinia svecica*, which was very rare at the sharp edge did not showed significant relation to the edge.

The distribution of the common species across the bushy sharp edges at the marshland at Kis-Balaton showed different patterns (Fig. 4). The Sedge Warbler showed strong edge preference and the Reed Bunting weak edge preference. The Reed and Savi's Warblers also showed edge preference, as in the case of sharp and interior sharp edges, but they tend to avoid the 0–5 m edge of the reedbed, where the bushes were present. The Great Reed Warbler and the Bearded Tit presented a more pronounced avoidance of the bushy zone, although the sample sizes were small.

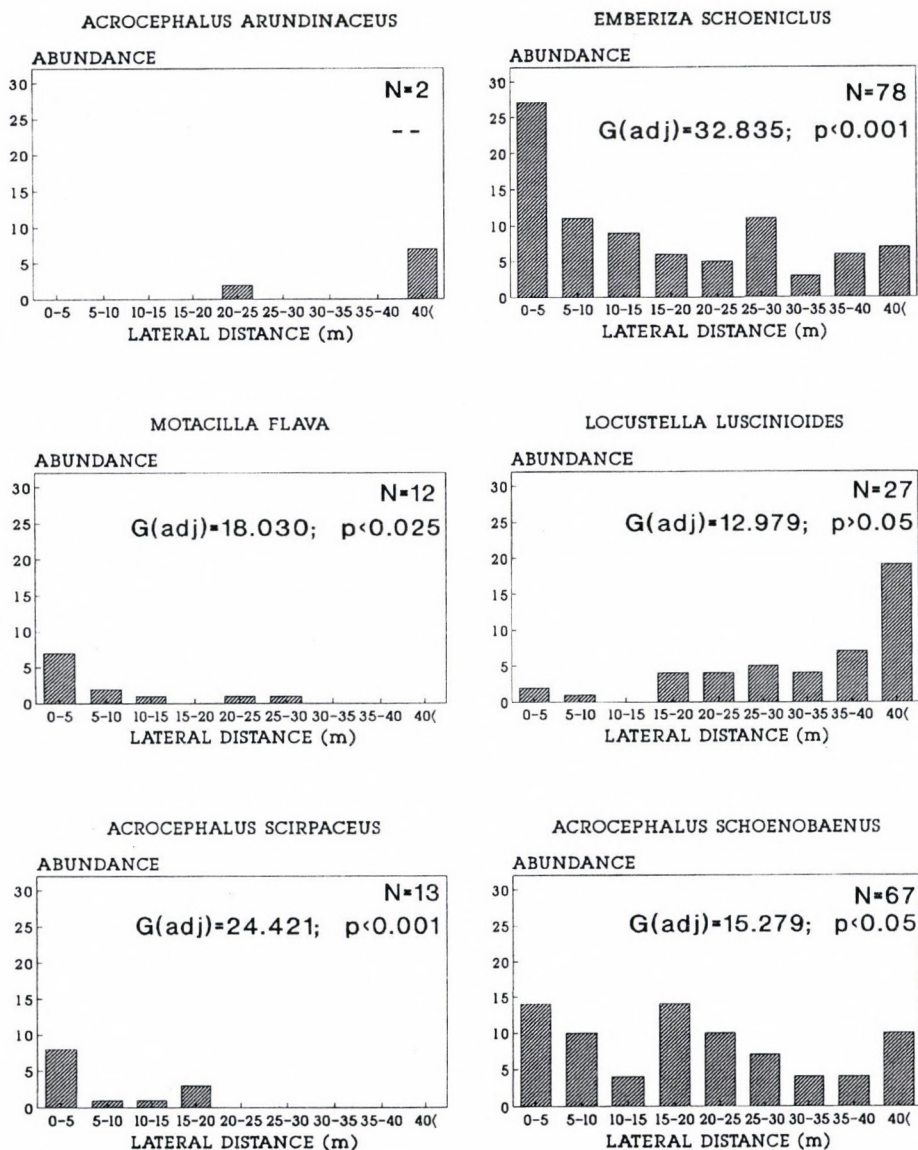


Fig. 5. Distribution of the number of individuals of the six most abundant passerine bird species at Macska-sziget across gradual edge. For analysis we used the 0–40 m zone (to which the N refers), but on the figures we presented the number of birds beyond 40 m, because it can give important additional information on the edge preference of species

There were six common species at the sharp and interior sharp edges at Lake Velence and the gradual edges at Macska-sziget, the Moustached Warbler *A. melanopogon* and the Bluethroat were absent from Macska-sziget. The Reed Warbler, Reed Bunting and the Yellow Wagtail *Motacilla flava* showed edge preference at this site (Fig. 5, the Yellow Wagtail, *Motacilla flava*, was included, as the sixth most abundant species at Macska-sziget). The latter two species preferred the reed – meadow edge, while the few Reed Warblers were observed on some sites where the reed was tall, e.g. near channels. The Savi's and the Great Reed Warblers avoided the gradual edge, they were observed further inside the reedbed, beyond the 40 m limit of this analysis (Fig. 5).

Five of the six abundant common species showed significantly different distribution across edges comparing the sharp and bushy sharp edges (Table 2), even after sequential Bonferroni corrections. The Savi's Warbler showed different distributions at the sharp and gradual edges (Table 2). Nine common reed-living bird species were observed at the bushy sharp and gradual edges (Table 3). Three wetland species occurred at Kis-Balaton, which were absent from Macska-sziget (Moustached Warbler, River Warbler *L. fluviatilis* and Penduline Tit *Remiz pendulinus*), and one species was censused only at Macska-sziget (Yellow Wagtail). The differences among the distributions of the abundant common species across the reed edge were significant in four cases, except the Reed Bunting (Table 2).

We observed only reed-nesting bird species at the Lake Velence study site, which is a homogeneous reedbed. However, at the two other sites, several passerine species were censused that do not depend upon the reed stands (Table 3). Their presence may be attributed to the landscape structure. At Kis-Balaton and Macska-sziget, not only reed stands and open water occurred in the censused areas, but several other habitat types, too, such as meadows, bushes and trees. In addition to the reed-nesting passerines, there were bush-preferring species (e.g. Robin *Erithacus rubecula*, Red-backed Shrike *Lanius collurio*), meadow species (e.g. Goldfinch *Carduelis carduelis*), and visitors from the nearby forest patches (e.g. Chaffinch *Fringilla coelebs*, Tree Sparrow *Passer montanus*) in these two study sites. However, the great majority of overall bird abundance (number of individuals) consisted of reed-living birds: 90.7% at Kis-Balaton and 91.5% at Macska-sziget. Although the forest- and meadow-living species were rare visitors in the reedbed edge, some characteristic bush and meadow species belonged to the bird community of the census area. They were thought to breed in the line of bushes at the reed edge.

Table 3. The presence-absence data of the observed passerine bird species at the three study sites. We omitted the interior sharp edge data from this table, because at the Kis-Balaton and Macskasziget study sites no interior parts were censused

Species	sharp edge	bushy sharp edge	gradual edge
<i>Acrocephalus arundinaceus</i>	+	+	+
<i>Acrocephalus palustris</i>		+	+
<i>Acrocephalus melanopogon</i>	+	+	
<i>Acrocephalus schoenobaenus</i>	+	+	+
<i>Acrocephalus scirpaceus</i>	+	+	+
<i>Aegithalos caudatus</i>		+	
<i>Carduelis carduelis</i>		+	
<i>Emberiza schoeniclus</i>	+	+	+
<i>Erithacus rubecula</i>		+	+
<i>Fringilla coelebs</i>		+	
<i>Lanius collurio</i>		+	+
<i>Locustella fluviatilis</i>		+	
<i>Locustella naevia</i>		+	+
<i>Locustella luscinioides</i>	+	+	+
<i>Luscinia megarhynchos</i>			+
<i>Luscinia svecica</i>	+		
<i>Motacilla alba</i>		+	+
<i>Motacilla flava</i>			+
<i>Muscicapa striata</i>		+	
<i>Panurus biarmicus</i>	+	+	+
<i>Parus major</i>		+	
<i>Passer montanus</i>		+	+
<i>Phylloscopus collybita</i>		+	
<i>Phylloscopus trochilus</i>		+	
<i>Remiz pendulinus</i>		+	
<i>Saxicola torquata</i>			+
<i>Saxicola rubetra</i>			+
<i>Sylvia atricapilla</i>		+	+
<i>Sylvia communis</i>		+	
<i>Sylvia nisoria</i>			+
<i>Sylvia curruca</i>			+

DISCUSSION

Opinions on how animal communities respond to forest edges are widely divergent (REESE & RATTI 1988, MURCIA 1995, BÁLDI 1996). Indeed, there are many studies on the effects of forest edges on bird communities, but the results are diverse. For example, HELLE & HELLE (1982), HANSSON (1983) and FULLER & WHITTINGTON (1987) found a much greater density in the edge. In contrast, LOVEJOY *et al.* (1986) found 60 percent fewer birds in the edge than in interior forests. Similarly, MARTIN (1983) found a lower density on small islands than on large islands, perhaps a consequence of impoverished edges. The confusion is not surprising: pattern may vary even in individual species. For example, the Robin has been shown to avoid deciduous forest edges (MOSKÁT & FUISZ 1994), to prefer edges (BÁLDI & KISBENEDEK 1994, BÁLDI & MOSKÁT 1994), and to occur irrespective of edges (FULLER & WHITTINGTON 1987). However, this is not surprising, because the edge effect depends on many factors. The three main factors are the (1) spatial scale (as in many aspects of ecology, WIENS (1989a)), (2) edge type (i.e. vegetation structure and landscape position of the edge), and (3) census methodology. We demonstrated in the present study that differences in edge effect do exist between different spatial scales and edge types in reed habitats. It is easy to accept that methodology may also have serious effects, since different bird census techniques usually give different results even in the same habitat and study area (MOSKÁT 1987). However, we used the same census technique in all the three habitats, and the censuses were made by the same person (AB); therefore methodological problems should be excluded here. In addition, one main point of our results, namely the edge-preference patterns of *Acrocephalus* warblers, which were observed by the line transect method, was confirmed by a mist-netting study (CSÖRGŐ 1995a). CSÖRGŐ found that, at the reed belt along the bank of Lake Balaton (ca. 5 km from the Kis-Balaton study area), the distribution of birds was similar to our observations: 43% of the Great Reed Warblers, 22% of the Reed Warblers and 11% of the Sedge Warblers were captured in the first 12 m from the water along a 144 m long mist-net line in July. The netting effort did not differ among mist-nets. Although more detailed investigations are needed to clarify the influence of methods on edge studies, it seems that for reed habitats the patterns are robust enough to be clearly detectable by different census techniques.

The similar results of the line transect and mist-netting studies have important methodological considerations. The detectability is supposed to decline with the distance from the observer, which may be a factor accentuating any edge effect in the local scale analysis. However, detectability had no significant effect on the results of this study, because, (1) the mist-netting study, where detectability has no influence, showed similar distribution pattern, and (2) within a few ten

Table 4. Patterns of relative abundance of seven reed-nesting passerine bird species in reedbed edges of different landscape position and vegetation structure. Interior: density estimation in a 25+25 m wide main belt, 200–300 m from the edge; see study area section for the description of the edge types

Species	interior	interior sharp edge	sharp edge	bushy sharp edge	gradual edge
<i>Acrocephalus arundinaceus</i>	very few	very few	many	few	absent
<i>Acrocephalus schoenobaenus</i>	many	medium	medium	many	medium
<i>Acrocephalus scirpaceus</i>	many	many	many	medium	few
<i>Emberiza schoeniclus</i>	few	few	few	medium	many
<i>Locustella luscinioides</i>	many	many	many	medium	few
<i>Luscinia svecica</i>	many	many	few	very few	absent
<i>Panurus biarmicus</i>	medium	many	many	very few	absent

meters, the detectability of bird song is not declining (SCHIECK 1997). This assumption is based on two arguments: (1) most of the observations belong to acoustical records, and (2) visual detections are almost negligible due to the very dense structure of reed-stands.

The scale-dependent response to fragmentation of forest birds was shown by JOKIMAKI & HUHTA (1996). Here we found differences in the response of the same species at different scales. The Great Reed Warbler showed similar edge preference at both the landscape and local scales at the Lake Velence study area. This pattern suggests a strong preference for reed edges and avoidance of interior reedbeds (Table 4). The Bluethroat preferred the interior of reedbeds, with no respect to small scale heterogeneities, like boat paths at the interior sharp edges. Thus, the Great Reed Warbler selected edges at both spatial scales, whereas the habitat selection of the Bluethroat avoided edges only at the larger scale. The Reed Warbler, Savi's Warbler and Bearded Tit showed edge preference at the local scale, both in sharp and interior sharp edges, but no obvious preference at the landscape scale. Therefore their observed distribution patterns may be a result of the occupation of the whole reedbed, but a local abundance in all edge types (Table 4).

The pattern of the dispersion of reed-living passerine birds across reedbeds is in accordance with the ecomorphology of these species. For example, the Reed, Savi's and Great Reed Warblers are well adapted to homogenous reeds (LEISLER 1975, LEISLER *et al.* 1989), therefore they avoided bushy and gradual edges. The Sedge Warbler is adapted to a more heterogenous habitat, therefore the edge preference at the bushy sharp edge, show the normal habitat selection of the species. A more detailed investigation is needed to understand edge effect in

the light of habitat selection and ecomorphology for all the reed living passerine birds.

What are the key factors which generated the edge preference of reedbed passerines at the local spatial scale? It should be noted that, although most marshland-nesting passerines have a relatively small territory (HUT 1986), the preference for the first 5 m of the edge reflects not to territory selection, but to within territory preferences, for example for nesting or foraging sites. CSÖRGŐ (1995b) found that >70% of the Great Reed Warbler nests were within 2 m of the edge. In general, there are two main candidate mechanisms determining bird reproductive success: food availability and suitable nest sites (MARTIN 1992, WIENS 1989b). In fact, the importance of both factors were demonstrated for *Acrocephalus* species: HOI *et al.* (1995) showed that prey abundance had a key role in determining mating system and male parental investment both at the intra- and at the interspecific levels, and SCHULZE-HAGEN *et al.* (1996) found that nest predation, which mainly depends on nest site, had significant effect on breeding success. However, the quality of both foraging and nesting sites depend on the vegetation and landscape structure. Dense vegetation, which occurs along edges, provides better nesting possibilities than scarce vegetation, and the expected increased nest predation rate in the edge (e.g. PATON 1994) was not supported for reedbeds. We conducted a nest predation experiment with a total of 50 artificial passerine nests, and daily depredation rate was slightly lower in the edge (4.7%) than in the interior (5.33%) of reedbed (BÁLDI, unpubl. data).

Although there is an inverse relation between vegetation density and prey abundance in homogenous reedbeds (ILLE & HOI 1995), edges harbour more insects than interior parts, in spite of the denser vegetation (HERBERT HOI, pers. comm.). Thus, both predation avoidance and food availability is better in edges of reedbeds, which may explain the general result of edge preference in our study.

An important point of our study is the demonstration of the individualistic response of bird species to the spatial structure of reedbeds. The reed-living passerine bird community is relatively species-poor and the species are more similar to each other than in a forest bird community, e.g. their body size is almost the same, except the Great Reed Warbler. In spite of their similarity, their distribution is different across the reedbed (Table 4). The individualistic responses of bird species to variations in environment was described on a continental scale (TAPER *et al.* 1995) and on a finer scale for forest birds (JOKIMAKI & HUHTA 1996). Here we demonstrated it on a local scale for reedbed birds. Other studies also showed species-specific response of birds in edge habitats (PARISH *et al.* 1995).

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THE “EXPECTED SPECIES SHARED” MEASURE TO COMPARE COMPOSITION OF DIPTEROUS AERIAL PLANKTON AND SHEEP DUNG FLY COMMUNITIES

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The parametric similarity measure family “expected species shared” (ESS) was applied to compare composition of flies in aerial plankton and in sheep dung fly communities collected in three dry sheep-runs in Hungary. A strongly fluctuating picture was found in both cases, when consecutive pairs in time were compared. However, beside a natural declining tendency in time (“time decay”), dung inhabiting assemblages showed slower changes and always higher similarity values than in samples from aerial plankton at the same time. The expected species shared measure family seem proper to demonstrate even the weak stabilizing effect of the shared sources also for the ephemeral and unstable insect assemblages of very small sized sources and this measure is proposed also to compare seemingly similar communities of different distances (and so demonstrate “distance decay”).

Key words: species richness, similarity index, expected species shared, Diptera, sheep-runs, aerial plankton, coprophagous flies

INTRODUCTION

A number of similarity indices are introduced in the ecological literature (for overviews see GOODALL 1973, etc.). Program packages provide computing assistance also for the application of a great number of those indices. In the present paper we report on experience with a less frequently applied similarity index. This index proved to be very useful in analysing our rather special data sets.

In the years 1992–94 collections of flies were made on three dry sheep-runs in two Transdanubian sites (W Hungary) and one site in the Kiskunság National Park (C Hungary) in order to detect features of community colonisation by coleopteran and dipteran populations (PAPP 1995). Pan traps were set out simultaneously to detect a part of the aerial plankton at the same places, particularly as a source of adult insects colonising droppings.

In this paper the similarity in abundance structure of dipterous species detected in the field samples is analysed. Data on Coleoptera are less numerous and not treated here.

The paper is mainly to demonstrate the virtue of the "expected species shared" (ESS) index but an interpretation of the results from an ecological point of view is also given; finally some concluding remarks are made on additional opportunities for its application.

MATERIALS AND METHODS

The data matrix on Diptera sampled from 20 pieces each of sheep droppings for a sample in three Hungarian dry sheep-runs by isolators (1991–94) is published in a former paper (PAPP 1995: Table 1) and is not repeated here. Sixteen pan traps (0.1 m², indefinite dull creamy colour, oriented to the wind direction) were exposed in a 30×30 m equidistant square-network for three hours in one sampling (PAPP & ÁDÁM 1996). Water with some detergent was used. Insects were filtered out and preserved in 70 % alcohol for study. For other details see PAPP & ÁDÁM (1996). Originally 29 tables with 16 columns for each were published, which were condensed into a single matrix for purposes of this paper. To do so, we had to re-evaluate or in several cases examine again those specimens, which were identified to genera only, and named as e.g., "*Megaselia* sp.1." or even "*Cecidomyiidae* sp. 2." As a consequence, the "*Sciaridae* sp.2." in the resulting large matrix is not necessarily the same as the species under this name in one of the tables in PAPP and ÁDÁM (1996), but based on the actual numbers any of the species is to be identifiable, if needed. Note that the total number of species in the aerial plankton is somewhat lower than we expected based on the separate samples but it is still high enough. This huge matrix with 29 columns and 315 lines is not published in the present paper.

Pairs of 32 and 29 samples (containing altogether 11215 individuals of 122 species and 18937 individuals of 314 species), respectively, were analysed for similarity. However, we use mainly the samples collected at Kunszentmiklós for comparison, since 21 sample series of the total of 32 collected by isolators, and 21 of the 30 pan trap collection series were made at this single site (for details see PAPP (1995), PAPP & ÁDÁM (1996)). When coding the samples, two or three letters for the site and two numerals for the year, month and day were used (FP: Zámoly; Forráspusztá, VB: Vértesboglár, KSZ: Kunszentmiklós. For example, KSZ940615 is for the site Kunszentmiklós on the 15th of June, 1994). For a more detailed comparison, data from only 1993 were used (however, KSZ930602 was omitted for its peculiar composition; see PAPP 1995).

There are numerous rare species in our samples. The parametric similarity measure family "expected species shared", "ESS" (GRASSLE & SMITH 1976, SMITH 1989) was chosen for similarity analysis, since the choice of a suitable parameter value makes it possible to analyse the similarity also in the domain of rare species.

$$ESS(A, B, m) = \sum_i (1 - (1 - p_{Ai})^m) (1 - (1 - p_{Bi})^m)$$

where p_{Ai} and p_{Bi} denote the theoretical values of the occurrence probability of the i -th species in the sample A and B, respectively ($m = 1, 2, \dots$)

The minimum variance unbiased estimate for ESS is

$$\hat{ESS}(A, B, m) = \sum_{i=1}^s \left[1 - \frac{\binom{N_A - n_{Ai}}{m}}{\binom{N_A}{m}} \right] \times \left[1 - \frac{\binom{N_B - n_{Bi}}{m}}{\binom{N_B}{m}} \right]$$

here N_A , N_B stay for the sample totals, n_{Ai} and n_{Bi} are the frequencies of the i -th species in A and B.

The underlying considerations behind this similarity measure are quite clear. If we choose m elements randomly and with replacement from each of two populations to be compared, the ESS is the expected number of common ("shared") species in the two samples. Dividing ESS by $\text{ESS}(A,A,m) + \text{ESS}(B,B,m)/2$, we get the *normalized expected species similarity index*, NESS (GRASSLE & SMITH 1976). It holds that $0 \leq \text{NESS}(A,B,m) \leq 1$.

The parameter m (≥ 1) must not exceed the half size of the smaller population. By changing the parameter value one can enhance the sensitivity of this measure to the small frequencies. Taking into account the high number of relatively rare species occurring in the samples, this is an advantageous property, as we demonstrate below. In addition, the interpretation of these indices makes possible to attribute some population dynamical aspects of the index value.

A third index, the *dissimilarity index* (DISS), the expected number of species occurring only in one of the populations, is easily derived from the NESS index, as

$$\text{DISS}(A, B, m) = \text{ESS}(A, A, m) + \text{ESS}(B, B, m) - 2 \text{ESS}(A, B, m).$$

The estimation of DISS can be obtained by the above estimation of ESS.

Calculations were performed by the proper option of the DIVERSI program package (IZSÁK 1998).

Parameters $m = 1$, $m = 20$ and $m = 50$ were arbitrarily chosen. $\text{NESS}(A,B,1)$ is equivalent to the Morisita index, and it highly emphasizes the differences in the domain of the high frequencies. On the contrary, $\text{ESS}(A,B,20)$ and particularly $\text{ESS}(A,B,50)$ are sensitive also to changes in the domain of small frequencies. Numerical experience regarding dependence of this sensitivity on m was gained earlier when using a similar index family, namely HURLBERT's diversity indices (HURLBERT 1971, IZSÁK 1994).

RESULTS AND CONCLUSIONS

Table 1 contains similarity and relative similarity values for $m = 1$ and $m = 20$, respectively. We calculated index values for consecutive days of collections. The third column values are the length of time interval between consecutive collectings. Some figures refer to dates in neighbouring years. For example, 218 days is the length of time interval between 13 October 1992 and 19 May 1993. Missing values regarding aerial plankton are due to missing observations. Some similarities concerning to sheep dung fly communities are missing, because samples A or B do not satisfy the condition of calculation, noted above. As for the similarity values, $\text{ESS}(A, B, 1)$ similarities are of course smaller than the corresponding $\text{ESS}(A, B, 20)$ ones. However, this does not apply to the NESS indices. As a direct consequence of the mathematical background, NESS values exceed their ESS counterparts with $m = 1$. With $m = 20$ the conversed relation is observable.

One can make some numerical observations not following from the mathematical background. NESS indices strongly correlate with the corresponding ESS index. Thus, their use does not add essential informations yielded by the ESS indices. Similarity indices of both m parameters indicate a larger compositional stability with sheep dung fly communities than with the aerial plankton. This unequivocal observation coincides with the biological intuition. The fluctuating faunal composition may product paradoxical results. For example, aerial plankton

Table 1. Expected species shared values and normalized expected species similarity in aerial plankton and in sheep dung sample pairs; consecutive pairs, 1992–94

			aerial plankton				sheep dung			
D	M	ΔD	m = 1		m = 20		m = 1		m = 20	
			sim.	r. sim.	sim.	r. sim.	sim.	r. sim.	sim.	r. sim.
Kunszentmiklós										
19	05									
		13	0.028	0.213	2.134	0.454	0.139	0.743	3.950	0.862
01	06									
		15	0.047	0.303	2.439	0.549	0.145	0.601	3.245	0.797
16	06									
		99	0.154	0.350	1.530	0.465	0.131	0.908	—	—
23	09									
		20	0.030	0.062	1.520	0.556	0.122	0.957	—	—
13	10									
		218	0.056	0.281	1.924	0.482	0.134	0.574	3.352	0.792
19	05									
		14	0.031	0.205	1.926	0.415	0.400	0.749	1.908	0.712
02	06									
		13	0.146	0.718	2.890	0.682	0.040	0.066	1.222	0.512
15	06									
		7	0.080	0.372	2.944	0.756	0.324	0.922	3.038	0.915
22	06									
		80	0.011	0.054	0.999	0.237	0.219	0.851	2.342	0.552
10	09									
		6	0.080	0.360	3.347	0.786	0.154	0.905	—	—
16	09									
		12	0.055	0.301	3.807	0.820	0.141	0.662	—	—
28	09									
		15	0.281	0.614	2.052	0.634	0.236	0.816	3.652	0.953
13	10									
		218	0.051	0.112	1.667	0.504	0.266	0.648	2.450	0.782
19	05									
		14	0.017	0.151	2.629	0.455	0.050	0.126	1.697	0.581
02	06									
		6	0.042	0.457	4.216	0.689	0.215	0.953	3.688	0.903
08	06									

Table 1 (continued)

D	M	ΔD	aerial plankton				sheep dung			
			m = 1		m = 20		m = 1		m = 20	
			sim.	r. sim.	sim.	r. sim.	sim.	r. sim.	sim.	r. sim.
		6	0.027	0.185	3.158	0.613	0.204	0.907	4.078	0.970
14	06									
		1	0.153	0.979	4.375	0.914	0.263	0.923	3.025	0.802
15	06									
		6	0.116	0.944	4.614	0.874	0.220	0.815	2.319	0.606
21	06									
		7	0.068	0.739	5.136	0.854	0.221	0.893	3.120	0.811
28	06									
Vértesboglár										
13	05									
		13	0.048	0.520	3.995	0.669	0.178	0.936	3.715	0.983
26	05									
		2	0.041	0.533	4.336	0.708	0.122	0.699	3.811	0.869
28	05									
		362	0.071	0.393	2.794	0.538	0.133	0.632	3.175	0.761
25	05									
		15	0.061	0.245	1.807	0.429	0.183	0.606	2.782	0.891
09	16									
		21	0.040	0.327	3.449	0.656	0.105	0.467	3.521	0.781
30	06									
		77					0.100	0.866	4.198	0.712
14	09									
Forráspusztá										
03	06									
		0					0.130	0.875	4.414	0.902
03	06									
		105	0.016	0.083	1.777	0.382	0.078	0.688	3.268	0.592
16	09									
		20					0.087	0.902	5.009	0.851
06	10									

Table 2. Expected species shared values in aerial plankton and in sheep dung sample pairs; Kun-szentmiklós, all pairs, 1993 and self similarities

ΔD	aerial plankton			sheep dung			
	m=1	m=20	m=50	m=1	m=20	m=50	
6	0.080	3.347	6.162	0.154	–	–	
7	0.080	2.944	5.467	0.324	3.038	6.084	
12	0.055	3.807	7.502	0.141	–	–	
15	0.281	2.052	3.408	0.236	3.652	4.440	
18	0.045	2.805	5.033	0.161	3.413	–	
27	0.106	2.416	4.736	0.117	2.210	4.191	
27	0.041	1.191	2.562	0.084	–	–	
33	0.062	1.363	2.417	0.090	3.765	–	
34	0.082	1.749	3.654	0.093	1.852	3.187	
80	0.011	0.999	2.556	0.219	2.342	–	
86	0.022	1.751	3.855	0.151	–	–	
87	0.007	0.939	2.523	0.287	2.796	–	
93	0.021	1.525	3.448	0.197	–	–	
98	0.009	1.047	3.127	0.147	1.922	3.337	
105	0.015	1.296	3.230	0.200	2.324	4.133	
113	0.004	0.196	0.698	0.065	1.708	2.746	
114	0.016	1.422	2.797	0.107	3.304	–	
120	0.034	1.974	3.865	0.090	2.213	3.684	
120	0.003	0.420	1.266	0.073	–	–	
132	0.030	1.836	3.875	0.125	3.351	4.291	
147	0.010	0.847	2.231	0.210	3.453	4.314	
self similarity ($\Delta D = 0$)							
D	M						
19	05	0.160	4.626	10.975	0.284	3.653	5.456
15	06	0.260	3.608	6.864	0.412	3.366	8.218
22	06	0.177	4.556	8.988	0.298	3.862	7.159
10	09	0.249	4.422	7.315	0.240	6.437	–
16	09	0.201	4.663	9.732	0.142	–	–
28	09	0.168	4.952	8.506	0.308	3.652	4.844
13	10	0.749	1.609	2.917	0.272	4.079	5.085

Table 3. Results of linear regression analysis on data in Table 2. Significance on 5% level

	m	slope of the regression line	F-ratio	level of probability	significance (S/NS)
aerial plankton	1	-7.8893E-4	11.39	0.0032	S
	20	-1.3722E-2	18.19	0.0004	S
	50	-2.0775E-2	12.06	0.0025	S
sheep dung	1	-2.4385E-4	0.522	0.4786	NS
	20	-2.5437E-3	0.397	0.5395	NS
	50	-7.1055E-3	1.635	0.2369	NS

composition at 16th June 1992, measured by the index ESS (A, B, 1), proves by far more similar to the composition at 23rd September than to the composition at 1st June.

When analysing the time dependence of similarity, we restricted the investigations on a more homologous data set. This is the ensemble of ESS values relating to the Kunszentmiklós collecting site in 1993. To amplify the data, we calculated the similarity indices for all possible pairs of days. As noted above, ESS indices with larger parameters give more emphasis to compositional changes in the domain of rare species. Therefore, it seemed to be informative to work also with $m = 50$. We figured out the self similarities, ESS (A, A, m) values, too. Monotone decreasing functions of self similarity can be taken for diversity indices. The numerical results are summarized in Table 2. The length of time intervals (ΔD) are arranged in a non-decreasing order. One can observe a decreasing tendency of similarity by increasing ΔD . We can call this phenomenon as "time decay". The erratical behaviour of self similarities refers to the complicated relation between assemblage composition and ESS values.

For a quantitative investigation of the mentioned decreasing tendency, we analysed the linear regression of ESS on ΔD . The results are given in Table 3. Not surprisingly, the slope of the regression line is negative in all cases. The regression is significant for all m parameters with the aerial plankton. The insignificant (if any) time decay for all m parameters with dung inhabiting assemblages refers to a larger structural stability. This result was not unexpected. However, the pan traps samples are not random beyond all bounds. There are species, which are present in all, or almost all samples; a good part of these "constant" species are characteristic for the sheep-run, e.g., *Coproica lugubris* and other *Coproica* spp., *Leptometopa niveipennis*, *Adia cinerella*, etc. No wonder, since these species are developing in sheep dung and move and seek for fresh dung. In addition, the sources of adult flies of other habits in the environs of the sheep run, produce also specimens of further "dominant" species characteristic for those habitats. All these circumstances result in a slight stability also in the composi-

tion of the aerial plankton detectible by pan traps. On the other side, as we noted above, the insufficient numbers of subsamples taken gave similarity values lower in the dipterous samples on sheep dung than probably existing; this is why the differences are not very contrasting.

When changes in rare species frequencies are emphasized in a greater extent, that is, with an increasing m , the (negative) slope increases (Table 3). One can conclude that the "time decay" is due mainly to the compositional changes of rare species. The "time decay" among the dominant and subdominant species is reduced.

CLOSING REMARKS

The term "distance decay" is frequently used in the ecological literature, particularly so in vegetation science. Time decay is a similar notion, being of importance when investigating composition changes in communities. To make observations on time decay of two different dipterous communities, we analysed fly species frequencies of aerial plankton and sheep dung. Because of the great number of rare species, we measured similarity by some members of the parametric similarity index family ESS (A, B, m). Namely, by increasing parameter m , the members of this index family become more and more sensitive to compositional changes in the domain of rare species. With ESS ($A, B, 50$) this is an expressed property. On the other hand, ESS ($A, B, 1$), which is analogous with the Morisita index, accentuates the changes of the dominant and subdominant species.

As expected, the results show the time decay is significant with the aerial plankton. With sheep dung fly communities the time decay is not significant, although the slope of the fitted linear regression line is negative here also. The rate of the time decay increases in parallel with the increase of parameter m . This refers to the fact that time decay is greater in the domain of rare species.

As a matter of course, the expected species shared measure is appropriate to analyse not only time decay but any kind of distance decay in plant and animal communities.

* * *

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PREDISPERSAL SEED PREDATION OF THE INTRODUCED FALSE INDIGO, *AMORPHA* *FRUTICOSA* L. IN HUNGARY

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Amorpha fruticosa is a widespread leguminous shrub from the United States now found in Hungary and in most of Central and Southeast Europe. Its predispersal seed predator (pre-DSP), in the new habitat, the bruchid *Acanthoscelides pallidipennis* is also native to the USA. Loss of seed crop to the seed predator only rarely exceeds 40%, which may indicate a predator-satiation strategy in *A. fruticosa*. The plant species is exploited by three bruchid species and by a leaf/flower-consuming and stem-galling lepidopterous community of at least nine members in the USA, and the level of parasitisation of *A. pallidipennis* is regularly high. On the contrary, neither the plant, nor its seed predator are used as resources by, respectively, other phytophagous insect herbivores and parasitoids from the local fauna in Hungary (i.e. both of them are unutilised resources). *Amorpha* contains rotenone, a natural insecticide, and this may explain the lack of consumption by non-adapted phytophagous insects in Hungary.

Key words: seed predation, Bruchidae, indigobush, rotenone, introduced species

INTRODUCTION

Seed predation is thought to be an important regulating factor in plant population dynamics and it is one of the thoroughly studied examples of this process (LOUDA 1982, CRAWLEY 1983, 1989a, 1989b, WATKINSON 1986). Seed predators are organisms that consume plant propagules and generally kill potential plant individuals (JANZEN 1971, AULD & MYERSCOUGH 1986 and others); therefore, they have a direct, easily measurable impact on plant fitness. Theoretically, specialized herbivores without food limitation are not likely to achieve population levels high enough to limit plant population growth (CRAWLEY 1989a), especially in the case of such plant strategies as predator satiation (JANZEN 1971), or if seedling recruitment is not limited by the availability of microsites for germination. Also, the impact of seed consumption cannot be directly compensated for by the plant (e.g. by compensatory regrowth; ISLAM & CRAWLEY 1983). Selection exerted by the postdispersal seed predator (post-DSP) most likely affects seed dispersal strategies (CASPER 1988), whereas predispersal seed predation (pre-DSP) may result changes in crop size (HARPER 1977) and crop apparency.

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The influence of seed-consuming organisms on a plant population depends on size, diet specialization, numerical population response, etc., of the seed predator, and also on plant reproductive characters. For this context the leguminous shrub *Amorpha fruticosa* and its pre-DSP, *Acanthoscelides pallidipennis* are considered here. False indigo (= indigobush) is an introduced and naturalized plant species in continental Europe. Seed predation of *Amorpha* in its natural habitat (in the USA) was documented by ROGERS & GARRISON (1975), among others.

The objectives of the present work were to collect and evaluate data that would form the basis for future investigations on the impact the pre-DSP of *Amorpha* may have on its host plant's population dynamics. They included studies on the biology of both the plant and its seed predator raising questions such as:

- whether exclusion of pre-DSP results in an increased seed production;
- how infestation patterns vary in space and time;
- how local plant colonisation proceeds;
- how local herbivorous and entomophagous faunas respond to the plant and its pre-DSP's presence.

MATERIALS AND METHODS

The plant

Amorpha fruticosa L. (Leguminosae, Astragaleae) in North America inhabits mostly stream banks. For a general description of its morphology, ecology and taxonomic relationships see REHDER (1951), HEGI (1975), KRUSSMANN (1976), and RICKETT (1979). The species was brought to England and grown as an ornamental as early as 1724, and to continental Europe about 1750 (HEGI 1975). In Hungary, following the First World War, it quickly spread along the shores of the Danube and Tisza rivers during the 1920–30s. By 1938 it was reported to outcompete oak seedlings along the river Sava, and by 1950 it was abundant everywhere in the country (PRISZTER, S. pers. comm.). Its southernmost European occurrence was reported from Turkey (DAVIS 1970). It is present in Russia (CZEREPA NOV 1973) and mainland China (FAN 1981).

Habitats primarily preferred by the false indigo in Eastern-Central Europe are water shorelines, flood areas, wet meadows (accompanying species: *Glyceria*, *Echinochloa* spp., *Polygonum lapathifolium*, *Bidens tripartitus*), gallery forests (accom. spp.: *Salix alba*, *S. fragilis*, *S. triandra*) and rarely marsh-meadows with *Alopecurus pratensis* (Soó 1966). The species seems to be associated with areas having a normal or high water table, or where temporary inundations occur; however, it can also be found in dry places.

Sampling and observations

Sampling and observations were begun in 1980 in diverse parts of Hungary (Table 6) and lasted for about a decade. Random samples of flowers, and pods at different phenological stages were regularly collected. Usually 7–11 infructescences were collected, their lengths measured, the number of pods counted and 10 to 20% of the pods of a raceme randomly taken as a sample to determine infestation of the infructescences. These pods were individually placed into small vials and the adult beetles allowed to emerge in the laboratory. This method was adapted as the bruchid species, if allowed, was able to produce at least one more generation in samples taken to the labora-

tory, thus making infestation levels unrealistic. Large samples (10000–20000 pods) were also collected to obtain parasitoids of *A. pallidipennis*.

The same plant populations were regularly visited, sampled, censused and observed to obtain data for plant and seed predator phenology, including behaviour in flowers or on other plant parts, oviposition, abundance of adults on the vegetation, etc. The number of eggs laid, hatching rate and oviposition sites were noted.

In one year (1986) samples of pods were taken weekly: (a) from mid-July until the end of August, letting the adults emerge in order to learn the earliest possible infestation date (relative to the rate of endosperm development), and (b) from September through November, freezing the pods after collection to kill all instars, and then dissecting them to determine the developmental phases before overwintering. The data on age-class distribution of the pre-DSP was compared by Duncan's multiple range test for unequal sample size.

The pod "rain" of fruiting plants was followed for two seasons at two localities by placing $1/16 \text{ m}^2$ ($25 \times 25 \text{ cm}$ size) plastic net-trays randomly on the soil surface under plant populations estimated to be 5–10 years old. The sum of the tray surface areas were 5 and 1 m^2 , respectively. The trays were checked at least twice each season by counting the number of intact pods and those having emergence holes. The first inspection (May) gave the number of pods fallen during late autumn and winter, while the second (October) sample was a mixture of pods that had overwintered on the plant + aborted and ripe pods of the new season.

In order to gain information about reproduction strategies of the plant species, pollinators were observed, flowers were isolated by nets, and root system of 19 individuals of various ages were examined (by partial or full excavation) to obtain evidence of vegetative propagation and/or root-root system connections of individuals.

The soil seed banks under parent plants were also sampled. Eight samples (a mixture of soil and plant litter), $48 \pm 22 \text{ g}$ each, were taken at 1–2 cm depth, brought to the laboratory, and the pre-DSP adults allowed to emerge.

The seed predator and other phytophages

The seed-consuming guild on *A. fruticosa* consists of three *Acanthoscelides* spp. in the USA (JOHNSON 1979) (Table 1) and one in China (FAN 1981). In Hungary, the only phytophagous seed predator is *Acanthoscelides pallidipennis* (Motschulsky) (Coleoptera, Bruchidae), a pre-DSP. It is an introduced species, native to North America, where it also infests *Errazurizia rotundata*, *Amorpha californica*, *A. canescens* and *Parryella filifolia* (all members of the tribe Amorphae; CENTER & JOHNSON 1974, JOHNSON 1979, 1981). It is not known when *A. pallidipennis* arrived to Europe. On the basis of museum records the first collections were from 1972 (Hungary, Bulgaria) and 1975 (Yugoslavia). The first specimens (two distinct samples) were identified by JOHNSON (1979, pers. comm.), but the species was described as new to Europe by WENDT (1981) based on data available from Hungary. By body and genitalia morphology the adults were remarkably uniform, a finding quite surprising because US populations are enormously variable (JOHNSON 1979, pers. comm.).

A survey of faunistic data on *A. fruticosa* in its native land indicates that at least three gelechiid moth species (one forms stem galls), six species from the families Pieridae, Hesperidae, Saturniidae and Notodontidae exploit the plant in various ways (TIETZ 1972, HODGES 1974, 1978) (Table 1). Most species are specialists on leguminous plants. In Europe, two scale species (*Eulecanium corni* and *Neopulvinaria ineretina*, the latter is an introduced species) (MITIĆ-MUŽINA 1960, SCALTRITI 1977) were reported to be occasionally present on *A. fruticosa*. The difference between the numbers of phytophagous insect species inhabiting *Amorpha* in its native and new habitats is significant ($\chi^2 = 7.9611$, $df = 1$, $p = 0.005$).

An experiment was performed to exclude the pre-DSP from *A. fruticosa* in 1993. Twenty-five racemes were randomly selected on different individuals of a mature, productive *Amorpha* stand (number of racemes per stem: 32.2 ± 17.0 , mean \pm SD, $n = 21$; number of raceme-bearing stems/ m^2 : 7.2 ± 3.8 , $n = 13$) in Szentendre-island, and at the start of pod initiation (June 10) for each of the following treatments: (a) sprayed with insecticide in two-week intervals and also bagged with a nylon net, (b) sprayed with water and also bagged with net, and (c) unsprayed and

Table 1. Phytophagous insect species on *A. fruticosa* in the US and in Central Europe.

Species	Source
USA	
Lepidoptera	
<i>Agonopterix dimorphella</i> CLARKE	HODGES 1974
<i>A. argillacea</i> WALSINGHAM	HODGES 1974
<i>Automeris io lilith</i> STRECKER	
<i>Catocala amestris</i> STRECKER	
<i>C. consors</i> (ABBOT et SMITH) ¹	
<i>Dasylophia anguina</i> (ABBOT et SMITH)	HODGES 1978
<i>Epargyreus clarus</i> (CRAMER)	
<i>Achalarus lycidas</i> (ABBOT et SMITH)	
<i>Zerene caesonia</i> (STOLL)	
Coleoptera	
<i>Acanthoscelides pallidipennis</i> MOTSCH.	
<i>A. submuticus</i> (SHARP)	JOHNSON 1979
<i>A. floridae</i> (HORN)	
CENTRAL EUROPE	
Coleoptera	
<i>Acanthoscelides pallidipennis</i> MOTSCH. ²	WENDT 1981
Homoptera	
<i>Eulecanium corni</i> LEON. ³	MITIĆ-MUŽINA 1960
<i>Neopulvinaria imeretina</i> HADZ. ⁴	SCALTRITI 1977

¹Uncertain, though *A. fruticosa* is mentioned as a food plant.

²Introduced.

³Occasional.

⁴Occasional and introduced.

unbagged. For insecticide treatment an organic phosphate ("Ultracide") was applied in a concentration of 0.2% (v/v). On Sept. 24 the racemes from all treatments were collected and evaluated for bruchid infestation.

The parasitoids

No parasitoid species native to North America seem to have been introduced far that attack *A. pallidipennis* in Hungary. ROGERS and GARRISON (1975) noted 3.5–9.4% parasitism by a single eulophid (*Horismenus productus* Ashmead) in the USA. This species, however, is a member only of a larger parasitoid guild present on *A. fruticosa* (CUSHMAN 1911).

Phytochemistry

Extracts prepared from the plant are toxic to arthropods (BRETT 1946a, b, BRETT & HODNETT 1947, HANSBERRY & CLAUSEN 1945). CROMBIE and PEACE (1963) and CROMBIE *et al.* (1971,

1973) proved that biosynthesis of rotenone takes place in the plant. Rotenoids were also isolated from fruits of *A. fruticosa* by SOMLEVA and OGNANOV (1985) and KASIMOV *et al.* (1972). Besides toxicity, the insect antifeedant property of chemicals isolated from pods of *A. fruticosa* was also demonstrated on non-adapted phytophagous species (GOMBOS & GASKÓ 1977, GOMBOS 1985). Pustules on the pods' surface contain resinous material and the entire plant smells of terpenoids. *Amorpha* possesses the nonprotein amino acid amide (τ -methylene glutamine) (BELL 1971), but lacks canavanine (BARNEBY 1981).

RESULTS

The plant

In addition to the central stem, several new vegetative shoots grow from the same root and extend the ground surface coverage of the plant. Similar-sized individuals slowly close the area between themselves, eventually reaching each other and providing an almost continuous canopy. New seedlings cannot be found under such multi-stemmed individuals (although germinated seeds having 2–3 cm long radicles may be found in the seed bank under the parent plants because shading is not strong). Seedlings spread around the outskirts of such large individuals, which sometimes approach 30 m in diameter.

New individuals are recruited from seeds. No root-root connections were found among individuals excavated at Szentendre-island in 1987. Although roots at first ran superficially, later they grew deeper and no vegetative reproductive structures were seen on them.

New shoots grow in May, flowering is mainly in June. The fragrant flowers open first at the lower part of an inflorescence (raceme). Outcrossing seems to be the fundamental breeding system, although self pollination is possible (HEGI 1975). (I have isolated several inflorescences with dense nylon nets. Pods never grew on such inflorescences. This does not exclude self-compatibility, only that pollinators may be needed for pod production.) Pollinators are mostly honeybees, and the pre-DSP bruchid itself. There are three or four inflorescences, 9–18 cm long per stem. The number of flowers per inflorescence is 291.5 ± 57.2 at blooming, while some days later that of the small pods is 246 ± 107.6 (mean \pm SD; $N = 46$, Szentendre-island, 1983), a ca. 20% decrease. Pods are one seeded, indehiscent, covered by pustules. They are 3–4 mm long in mid-July and reach full maturity and length by the end of August, and early September. The pods are 5–10 mm long, and slowly but continuously drop when ripe. The first pods that drop are overwhelmingly aborted and rarely harbour developing bruchid larvae that reach adult-stage (among 623 pods only 6% yielded adults). A substantial proportion remains on the parent plant, overwinters and can even be found the next summer. The number of infructescences from the previous year's crop counted the next year in May was still 15.3 ± 9.8 (mean \pm SD; $N = 38$, Szenten-

Table 2. Number of infructescences overwintering on plants, and of pods dropped into trays under a single *A. fruticosa* bush. Locality: Nagykovácsi-Júlianna major (means \pm SD).

Date	No. of pods dropped		No. of racemes remained on plant ²	No. of pods remained on plant ²
	per tray	per square meter ¹		
10/14/1987	—	—	222	—
until 3/30/1988	76 \pm 27	1223 \pm 440	82	51 \pm 33
until 5/19/1988	80 \pm 32	1272 \pm 512	58	26 \pm 15
until 6/1/1988 ³	92 \pm 37	1476 \pm 604	0	0
until 8/17/1988 ⁴	79 \pm 43	1272 \pm 693	—	—

¹Assuming homogeneity of distribution.²Pods of the main racemes.³No last year pods remained on plant.⁴Early falling pods of the new growing season.

dre-island, 1988) per largest plant stems (2–4 cm diam. at 50 cm height). (See similar data in Table 2 for a smaller bush at another locality.) Before the onset of winter, 155.4 \pm 47.6, 175.6 \pm 60.5, and 143.0 \pm 50.9 (mean \pm SD) pods could be found at three localities, respectively (N = 7, 1988), representing again a further ca. 20% decrease in comparison with the number of flowers. The number of larger (1–4 cm diam.) plant stems per m² was 12 \pm 3 (N = 14 plants) while the number of infructescences per stem was 9.0 \pm 10.1 (N = 46; both data from Szentendre-island, 1988). The number of fallen pods per m² (a rough estimate) through three collection periods is given in Table 3. Values calculated for another locality differed substantially due to size and age of plants (Table 2).

Dropped pods (either infested with the bruchid or intact) are buried in the soil and covered by leaf/twig litter. Samples taken from the upper soil layer under the parent plant [48 \pm 22 g soil] contained 314.6 \pm 187.3 (mean \pm SD) pods. The time required to accumulate this number is not known. Such samples, however, probably do not adequately represent the seed bank in the soil (BENOIT *et al.* 1989).

Table 3. Pods dropped by an *A. fruticosa* population into trays placed under the plants (Szentendre-island, 1987–89, starting with 84 trays).

Interval of crop collecting	Percent of trays recovered	No. of pods counted per tray	No. of pods calculated for m ² , ¹	Percentage of infested pods in trays
Oct. 1987 – May 1988	59.5	315 \pm 219	5049 \pm 3505	1.8 \pm 1.6
May 1988 – Oct. 1988	40.5	371 \pm 295	5928 \pm 4711	4.0 \pm 4.1
Oct. 1988 – May 1989	28.6	202 \pm 100	3236 \pm 1604	3.7 \pm 4.4

¹Assuming homogeneous distribution.

In 1987 a ca. 1 km long \times 10 m wide indigobush population was discovered which had a crop from the previous year (with many pods on the plants), but no new fruits, therefore, it was considered a "nonmasting" population. Numerous adults of the pre-DSP were collected on this population which was ca. 1 km away from the nearest *Amorpha* population bearing a large fresh crop ("masting" population).

The seed predator

Adults emerge from infested pods on or under the host plant for at least three months beginning in June. They are very mobile, fly well and prefer sunlit surfaces. While flowers are available, they actively move into them (and frequently emerge covered with pollen). They also occur on leaves of *Amorpha*, and in the absence of host plant inflorescences, on flowers of nearby plants (e.g. *Matricaria*). Occasionally adults could be observed in sunflower (*Helianthus annuus*) heads (HORVÁTH 1987). They also temporarily occupy the surrounding vegetation. Sweep netting on the host-plant (following flowering) resulted in 9 ± 7 adults, and on non-host plants in the vicinity 0.9 ± 0.9 adults (mean \pm SD; 10 sweep-net strokes; Szentendre-island, 1987).

Table 4. Egg-load of *A. fruticosa* infructescence axes at pod ripening and before pod-drop (means \pm SD).

Locality/date of sampling	N	Raceme axis length (cm)	No. of eggs/raceme axis ¹	No. of ripe pods/raceme	Bruchid infestation (%)
Balatonzamárdi					
Aug. 1980 ²	19	8.7 \pm 3	9.7 \pm 9.6	71 \pm 44	61 \pm 11
Aug. 1985	11	14.6 \pm 1.4	101.5 \pm 60.2	209 \pm 77	29 \pm 7
Oct. 1986	11	12.4 \pm 1.8	210.0 \pm 114.4	160 \pm 35	6 \pm 6
Sept. 1987	11	16.3 \pm 1.9	72.5 \pm 75.4	245 \pm 91	11 \pm 11
Oct. 1988	7	12.2 \pm 1.2	59.4 \pm 53.1	155 \pm 48	32 \pm 25
Szentendre-island					
Oct. 1987	11	15.4 \pm 1.5	21.9 \pm 18.1	232 \pm 56	12 \pm 8
Oct. 1988	7	11.9 \pm 3.1	2.7 \pm 3.7	176 \pm 61	7 \pm 8
Sárosd					
Dec. 1988	7	11.6 \pm 1.9	55.3 \pm 42.6	143 \pm 51	18 \pm 19

¹Eggs laid under the calyx are not included.

²Overwintered racemes. Counted and measured next summer (1981).

Most egg-shells must have been washed down during winter.

Egg-laying starts about mid-July, when pods are hardly bigger than the surrounding tube-like calyx (3–4 mm). (An ovule of $0.5\text{--}1 \times 2\text{ mm}$ is attached to the distal end of the pod.) Two sites in the flowers are used by females for oviposition: one is the axis of the raceme (Table 4), and the other is the gap between the pod wall and calyx-tube. Egg-laying females thoroughly examine the pod surface by running around it, touching it from time to time with the antennae, palpi and with the tip of the ovipositor. Following oviposition the female drags the ovipositor on the pod's surface. While the raceme axis is sometimes densely packed with eggs, only 1–5 eggs/pod are laid under the calyx. The eggs laid on the raceme axis are unevenly spaced into groups and most of them are fertile (bear larval exit holes). It is probable that infestation level is based on the former, and only to a minor extent by larvae hatching from eggs laid on the raceme axis. There is no significant correlation between pod density (= the no. of pods/raceme axis length in mm) and the number of eggs laid on raceme axis (Fig. 1, linear regression, $n = 98$, $r = 0.0761$, NS). Similarly, percentage of damaged pods along the raceme axis is not correlated with increasing number of pods (Fig. 2, $n = 98$, $r = -0.0728$, NS). In fact the relationship is density-independent. Therefore, there is little contribution to infestation from eggs laid on the raceme axis. Their numbers sometimes surpass the number of pods on the raceme by the end of pod ripening (mid-October, 1986; mean ratio and SD is 1.35 ± 0.73 , extremes: 0.7 and 2.6, $n = 11$), while opposite relationships were found in another year (in July: 0.28 ± 0.16 , $n = 7$; in August: 0.46 ± 0.25 , $n = 21$; in October 0.43 ± 0.41 , $n = 7$, all data from the same locality, 1988).

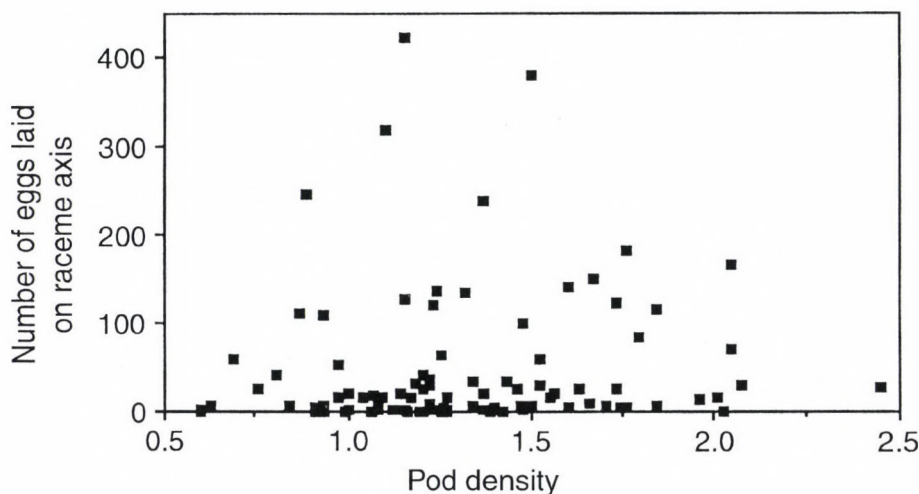


Fig. 1. Scatterplot of the number of eggs laid by the seed predator, *A. pallidipennis* on raceme axes as a function of pod density (total number of pods/total axis length in mm) on *A. fruticosa*. The scatterplot comprises data from the localities Szentendre-island, Balatonzamárdi, Sárossd and Üröm, from years 1986–89 ($n = 98$)

Emerging first instar larvae have legs and bore into the pods under the calyx, then enter the seed at its proximal end. (First instar larvae sometimes bore deep holes on the raceme axis.) During development the yellow-coloured larva consumes the larger part of the seed, however, some endosperm sometimes remains at the distal end. The number of stadia is not known to me. Adults from eggs of early oviposition in the same year may emerge in September-October, however, the overwhelming majority overwinter as quiescent larvae (Table 5, and WENDT 1981). The larvae pupate within the seeds, the adults produce exit holes at the proximal end of pods (right above the calyx). The one-seeded pod's endosperm is large enough for one larva only.

Crop loss of indigobush to *A. pallidipennis* varied according to year and locality (Table 6), but it never reached 100%. The exclusion experiment saved ca. 6% pods from being infested with the pre-DSP. A combination of insecticide spray and bagging resulted in a bruchid infestation level of $0.06 \pm 0.17\%$, the spray with water plus bagging produced $0.15 \pm 0.35\%$, and unsprayed and unbagged control had a pod infestation level of $6.29 \pm 6.57\%$ ($n = 25$). There was an infestation level of $17.5 \pm 3.2\%$ of pods by *A. pallidipennis* extracted from the soil samples.

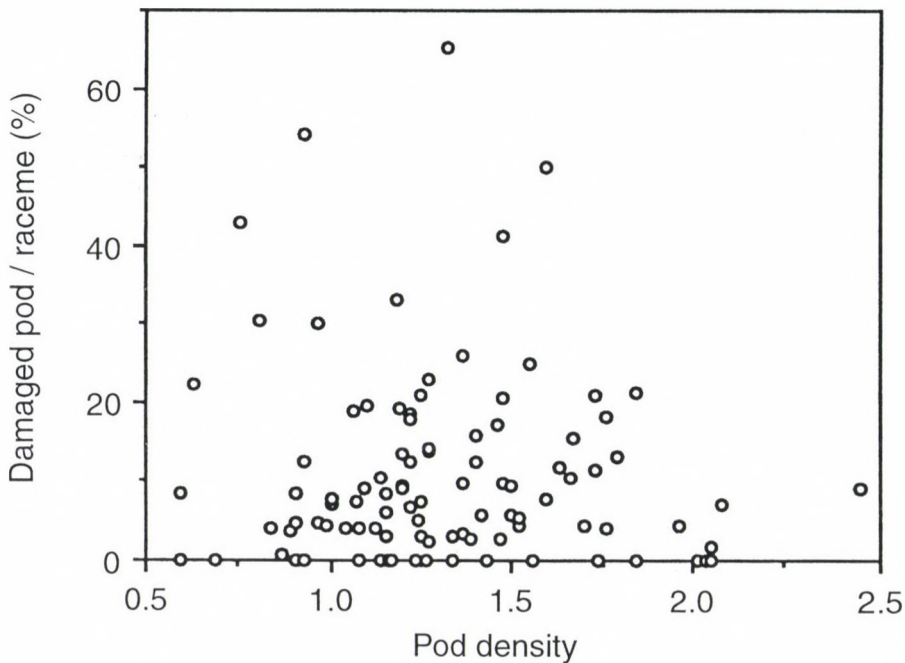


Fig. 2. Scatterplot of infestations caused by the seed predator, *A. pallidipennis* as a function of pod density (total number of pods/total raceme axis length in mm) on *A. fruticosa*. The scatterplot comprises data from the localities Szentendre-island, Balatonzamárdi, Sárossd and Üröm, from years 1986–89 ($n = 98$)

Table 5. Age-class distribution of *A. pallidipennis* larvae before overwintering ($n = 7 \pm 15$ pods each; means \pm SD).

Date (1986)		"Young" ¹	"Old" ²	Infestation (%)
		larvae (%)		
September	15	30 \pm 11a	10 \pm 20b	39 \pm 26a
October	1	22 \pm 8ac	13 \pm 22ab	34 \pm 19a
	8	11 \pm 7bc	16 \pm 18ab	28 \pm 24a
	20	7 \pm 7b	22 \pm 12ab	27 \pm 19a
	29	6 \pm 6b	27 \pm 16a	23 \pm 11a
November	4	7 \pm 7b	27 \pm 28ab	20 \pm 25a
	12	1 \pm 3b	27 \pm 11a	21 \pm 13a
	24	4 \pm 5b	29 \pm 7a	25 \pm 9a

¹ L₁–L₂?² L₃–L₄?

Means followed by the same letters in a column are not significantly different at the 0.1% ("young") and 5% ("old") probability levels (DNMR-test for ESS, see Materials and Methods).

The parasitoids

Many pods were collected regularly over a decade. On occasion, low numbers of parasitoids emerged. For instance, of 18,560 pods collected at Szentendre-island (1988) there were 7.05% bruchid and 0.15% parasitoid infestations (a total of 2 parasitoid specimens). The result of several years' collections were ca. 30 parasitoid specimens from the *Pteromalus*, *Dinarmus*, *Mesopolobus* (Pteromalidae), *Eupelmus* (Eupelmidae) and *Triaspis* (Braconidae) genera. A low percentage of egg parasitisation by *Trichogramma* sp. has also been detected.

DISCUSSION

The relationship between indigobush and its pre-DSP is an intimate one. The plant produces toxic insecticides (rotenones). Presently it is not known how *A. pallidipennis* larvae cope with the toxins. There are at least two possibilities: Avoidance of toxins is possible if pustules on the pod are the sites where they are stored (BRETT 1946a, CENTER & JOHNSON 1974), and at the same time seeds do not contain or possess only a low amount of such substances. Thus, by entering the pod through a site devoid of such glands, the toxins can be avoided behaviourally. [A quite opposite situation was described by CENTER and JOHNSON (1974) for *A. submuticus*, another pre-DSP of *A. fruticosa*, where the first instar larvae preferred entering the pod via the pustules.] More likely is the possibility that the

seeds do possess such chemicals because both dormant seeds and seedlings of *A. fruticosa* contain pre-rotenoid chemicals that are mobilised during germination and early growth (CROMBIE *et al.* 1973). In this case, the bruchid, while inside the seed, must "handle" the toxins metabolically, perhaps in the way described by SZENTESI and WINK (1991) for another pre-DSP species inhabiting the alkaloid-bearing *Laburnum anagyroides*.

Table 6. *A. pallidipennis* infestation of *A. fruticosa* pod samples in Hungary (N = 7–56 racemes; means \pm SD).

Site of collection	Year	Adult emergence (% of pods)
Balatonzamárdi	1985	30.0 \pm 32.4
	1986	5.8 \pm 6.2
	1987	11.4 \pm 10.6
	1988	31.9 \pm 25.0
	1989	9.6 \pm 7.7
Szentendre-island		
"masting" population	1983	1.4 \pm 1.8
"masting" population	1987	11.6 \pm 7.5
"non-masting" population	1987	0
"masting" population	1988	7.1 \pm 7.5
"masting" population	1989	2.9 \pm 3.0
"non-masting" population	1989	12.7 \pm 6.5
"masting" population	1993	6.3 \pm 6.6
Tiszaug – river Tisza shore	1984	4.6 \pm 4.2
Szarvas – river Körös shore	1985	19.8 \pm 11.6
Botanical garden	1984	17.7 \pm 10.0
Botanical garden	1985	0
Vácrátót- Botanical garden	1983	16.0 \pm 15.3
	1984	1.1 \pm 1.3
Budapest	1983	16.0 \pm 15.3
Ohat	1984	7.6 \pm 8.7
Balatonszabadi	1983	14.5 \pm 9.2
Sározd	1987	0
Nagykovácsi-Júlianna major	1988	18.2 \pm 19.4
	1984	11.1 \pm 15.9
	1986	19.3 \pm 16.6
Üröm-Pilisborosjenő	1989	6.9 \pm 7.1

Impact and exploitation patterns of A. fruticosa by its pre-DSP.

Herbivore exclusion experiments (e.g. WALOFF & RICHARDS 1977) clearly show that plant performance is better in the absence of herbivores. Available information (see CRAWLEY 1989b) indicates that invertebrate herbivores sometimes are able to affect the population dynamics of introduced plant species. JERMY (1984) assumed that the effect of herbivores on introduced plant populations was due to the absence of natural enemies allowing the herbivore population to reach outbreak levels. On the basis of occasionally high (87%) pod infestation by *A. pallidipennis*, ROGERS and GARRISON (1975) hypothesized that the seed predator was able to regulate indigobush populations to some extent in the USA. Although released from the impact of native natural enemies (see Table 1) the bruchid still rarely produces a crop loss over 40% in Central Europe. My exclusion experiment on *A. fruticosa* saved about 6% of pods from its pre-DSP that may gain significance at locations only where plant recruitment is possible due to free sites. Infestations by the bruchid are uneven by locality (Table 6), by plant and among racemes, and are much lower than what the number of available pods would allow, and this indicates that the plant may satiate its seed predator.

The data obtained in this study are not sufficient to draw quantitative conclusions on plant population dynamics as affected by the pre-DSP. Nevertheless, they do give some information on plant performance. It seems that *A. pallidipennis* is neither food-limited on *A. fruticosa*, nor limits the distribution and spread of its host plant. Instead, the inability of seedling recruitment by the shortage of available microsites around parent plants may be more important. The number of seeds exponentially decreases by distance from the parent plant (HARPER 1977, HOWE 1986) and even there, establishment depends on many factors. In spite of the large number of pods produced/m²/year by *Amorpha*, only those that were dispersed at some distance from the parent plant had a chance for survival. The high terpene content of pods and other plant parts might hamper germination under the parent plant, although to date no such investigations have been carried out.

The egg-laying habit of the pre-DSP seems contradictory. Despite the potential for a higher infestation level of pods, it does not occur even when the number of eggs laid on a raceme axis considerably surpasses the number of pods available on that raceme (Table 4, 3rd line). Some factors must cause a high L₁ mortality. The larvae hatching from eggs laid under the calyx tube are at an advantage in entering the pod in comparison with those from eggs placed on the raceme axis that must crawl along the axis to find a pod. Dragging of the ovipositor, possibly connected with pod-marking behaviour, also seems to have a dubious significance as usually more than one egg is laid under the calyx. Uneven distribution of eggs along racemes may be explained by the order of pod maturation (lower to upper). Similar oviposition patterns (i.e. overload of pods by eggs) are

quite abundant among bruchid species (LABEYRIE 1990, SZENTESI & JERMY 1995, SZENTESI *et al.* 1996).

In view of these data, the questions arise whether the ovipositing *A. pallidipennis* females were able to assess resource size, and what factors influenced egg-laying. Two raceme characters may determine the assessment: raceme axis length and number of pods on the raceme. Neither is egg-load affected by pod density (Fig. 1), nor does infestation level correlate with it (Fig. 2). It is possible, however, that egg-load assessment is influenced at the early stage of pod production, when the crop is about 40% higher in comparison to that at pod ripening (the difference is the result of pod-abortion). The imperfection of female oviposition behaviour may also be a contributing factor.

Possible escape mechanisms by A. fruticosa

One escape mechanism may be connected with masting. It could serve as a predator satiation mechanism when crop is abundant (masting year) followed by year(s) without crop (JANZEN 1971, HARPER 1977). It is supposed that many leguminous species are able to change the size of crop synchronously within a population, and *A. fruticosa* is one of the shrub species having cyclic cropping (SILVERTOWN 1981). Occurrence of such a seed predator avoidance strategy may be expected. Although it is not experimentally proven, my observation supports this view. Previous year and next year infestation levels (varying greatly, Table 6) should, theoretically, give some information on the population size changes of the seed predator, however, to prove or manipulate this experimentally is almost impossible (CRAWLEY 1989a). Another escape mechanism could be provided by the phytochemical properties of the species. Although, it has not been investigated experimentally, it is very likely that non-adapted herbivores as well as members of the third trophic level are affected by toxins present in *A. fruticosa*. Several food chain studies demonstrated that, among experimental conditions, an elevated or close to natural concentration of plant allelochemical in the host's diet would seriously affect survival of the primary parasitoid (THURSTON & FOX 1972, BENN *et al.* 1979, PRICE *et al.* 1980, CAMPBELL & DUFFEY 1981, BARBOSA *et al.* 1986, THORPE & BARBOSA 1986).

A. fruticosa and its seed predator as unutilised resources

It is a widely held view that some introduced plant species rapidly and successfully spread at the place of introduction because (1) they were free from their native herbivores (JERMY 1984), and (2) they usually occupied disturbed areas first. Established introduced-immigrant species free from consumers in the new habitats may exist as unutilised resources or occupy "empty niche space" (PRICE 1984, LAWTON 1982, 1984, STRONG *et al.* 1984, ARTHUR 1987, WALKER & VALENTINE 1984, COMPTON *et al.* 1989, but see CRAWLEY 1987, for counterar-

guments). Seemingly, since its introduction, *A. fruticosa* is an "unexploited" or only occasionally used resource by herbivores of the local phytophagous insect fauna in Central Europe. The only representative in Central Europe of the seed predator community in the USA is *A. pallidipennis*; therefore, the partitioning of the seed resource is incomplete in the invaded areas. To the contrary, there are at least nine, mostly oligophagous lepidopteran species on *A. fruticosa* in its native habitat (Table 1). The utilization of the pre-DSP as a resource by parasitoids is also more intensive in the USA, although it is restricted to one parasitoid species (ROGERS & GARRISON 1975). In Central Europe parasitisation is insignificant (ca. 0–0.2%) and occasional, and is probably exerted by species of wider host preference. In this sense *A. fruticosa* and its seed predator are indeed unutilised resources in their new habitat.

As for the factors affecting the presence or absence of herbivores, chance events (JERMY 1990) may be more important than previously thought. In addition, some (e.g. chemical) properties of the plant also have to be taken into account. For instance, BIRCH *et al.* (1985) demonstrated that rotenoids of *Lonchocarpus* are indeed toxic to the non-adapted seed predator, *Callosobruchus maculatus*. However, it is also a possibility that potential colonists may be lacking in the invaded habitats (LAWTON & STRONG 1981).

Introduced species are able to change genetically (BERENBAUM 1991). The plant was brought into Europe perhaps 200 years earlier than its seed predator. During this time phytochemical changes might have taken place influencing present relationship with the seed predator and actually resulting in lower infestation levels than those reported by ROGERS and GARRISON (1975) for the USA. Another point might be a lower genetic variability of the bruchid population originating from a single introduction (JOHNSON 1979, pers. comm.), although this assumption was made only on the basis of morphological examination and no other (e.g. molecular) studies were carried out.

* * *

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edited by Á. SOÓS, L. PAPP and P. OOSTERBROEK

Volume 1 Trichoceridae – Nymphomyiidae

The Catalogue contains the basic taxonomic, nomenclatorial and distribution data of all species occurring in the Palaearctic Region with the fundamental morphological features for the majority of the fly groups.

Contents: Introduction to Volumes 1–13 (Á. SOÓS and L. PAPP). History of the Catalogue of Palaearctic Diptera. Structure. Genera and their type-species. Species names, type-localities. Distribution. Literature data, references. Dates of publication. Readers. Acknowledgements and closing remarks. List of contributors (Vols 1–13). Type-species designations in Volume 1. New names proposed in Volume 1. Families: Trichoceridae (C. DAHL). Tanyderidae (R. WAGNER). Blephariceridae (P. ZWICK). Deuterophlebiidae (L. JEDLICKA). Tipulidae (P. OOSTERBROEK and BR. THEOWALD). Cylin-drotomidae (Á. SOÓS and P. OOSTERBROEK). Limoniidae (E. N. SAVCHENKO, P. OOSTERBROEK and J. STARY). Ptychopteridae (R. ROZKOSNY). Nymphomyiidae (L. JEDLICKA). Bibliography. Index.

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MICROBRADYMERUS GEN. N. (COLEOPTERA: TENEBRIONIDAE, COELOMETOPINAE) FROM THE ORIENTAL REGION*

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Microbradymerus gen. n. (Coleoptera: Tenebrionidae, Coelometopinae) is described and contains the following new species: type species *merkli* sp. n. (Borneo), *kazirangicus* sp. n. (Assam) and *assamicus* sp. n. (Assam). These species are most similar (=related ?) to the species of *Bradymerus*. The new genus can be separated from *Bradymerus* by the shape of the antenna with all antennomeres short and broad; the antenna with antennomeres 9 and 10 distally with a complete brush of dense light sensilla; the scutellum surrounded by the medial groove of the pronotum; pronotum with smooth lateral margins; body small (2.5–4.8 mm) and with clavate setation.

Key words: Coleoptera, Tenebrionidae, Coelometopinae, *Microbradymerus* gen. n., new species, Borneo, Assam.

INTRODUCTION

During my identification work with Oriental Tenebrionidae I received material from Borneo and Assam, which has been already labelled by the late Dr. Kaszab as "nov. gen. aff. *Bradymerus*". This material is described in the present paper. The specimens cannot be assigned to any of the known genera because of the combination of characters. The three new species of this new genus are most similar to the species of *Bradymerus*. The last revision of the Oriental species of *Bradymerus* was given by GEBIEN (1925), further species from that area were described by KULZER (1951).

The species of the tenebrionid genus *Bradymerus* PERROUD, 1864 are fungus dwellers occurring mostly in tropical forest habitats. This genus is quite species-rich, like the similar (=related ?) genera *Bolitonaeus* LEWIS, 1894, *Byrsax* PASCOE, 1860, *Chaetopsia* GEBIEN, 1925, *Dicraeosis* GEBIEN, 1911 and *Falsonannocerus* PIC, 1946. Synapomorphic characters of these genera are unknown; all need revision and several synonymies and new species may be expected. *Bradymerus* and *Dicraeosis* were removed from the Bolitophagini (which is a tribe of the Tenebrioninae) and transferred to the Coelometopinae by DOYEN & TSCHINKEL (1982), probably the closely related *Chaetopsia* and *Falsonan-*

* Contributions to Tenebrionidae no. 26. For no. 25 see: Rev. suisse zool. 106(2), 1999.

nocerus must also be assigned to that subfamily (MERKL in litt.). The herein described *Microbradymerus* gen. n. is also included in the Coelometopinae, although the phylogenetic classification of the Tenebrionidae in general and of the huge Coelometopinae in particular is not clear in all aspects.

Microbradymerus gen. n.

Genus diagnosis: With all diagnostic characters of the genus *Bradymerus*, including labrum with transverse keel, epipleuron not reaching elytral apex, elytra with rows of punctures and elytral intervals often with longitudinal tubercles. Surface of body, antennae and legs with dense clavate setation and between this setation covered by a layer of agglomerations (in *Bradymerus* naked). Antenna with antennomere 3 not or only slightly elongated, all antennomeres broad, antennomeres 9–11 forming an indistinct club (in *Bradymerus* antennomere 3 distinctly elongated, antennomeres 1–5 narrow, 6–11 broader and forming a indistinct club). Antenna with antennomeres 9 and 10 distally with a complete brush of dense light sensillae (in *Bradymerus* only with small patches of sensillae). Clypeus and genae swollen (in *Bradymerus* clypeus flat and genae plate-like). Pronotum with smooth lateral margins (in *Bradymerus* wavy or with tubercles). Scutellum with the basal part surpassing anterior margin of elytra so that this part is surrounded by the medial groove of the basal margin of the pronotum. Claw segments of all tarsi not prolonged, shorter than or equal to joint basal segments (in *Bradymerus* claw segments distinctly longer than joint basal segments).

Etymology: Combination of Micro (body size 2.5–4.8 mm) and the genus *Bradymerus*, gender masculine.

Type species: *Microbradymerus merkli* sp. n. by present designation.

Remarks: The new genus may easily be separated from *Bradymerus* by the shape of the antenna with all antennomeres short and broad; quite characteristic is also the antenna with antennomeres 9 and 10 distally with a complete brush of dense light sensilla. The close connection of the scutellum surrounded by the medial groove of the pronotum, as well as the smooth lateral margins of the pronotum are further unique characters. Additionally, the clavate setation of the body is quite unusual, but occurs also in some species of the genera *Chaetopsia* and *Falsonannocerus*.

Microbradymerus gen. n. contains at least 3 species from Borneo and Assam, all described herein as new. They can easily be separated by the shape and size of pronotum and elytra, by the shape of the antenna, by the structure of the elytral intervals and by the existence or lack of sexual characters on the tibiae. The aedeagus is similar in both investigated species (third species is only rep-

resented by a single female) and consists of a tube-like basal piece, paired and spatulate parameres, and a long and narrow stick-like penis (Figs 11, 17).

***Microbradymerus merkli* sp. n.**

(Figs 6–11)

Holotype (male): Indonesia, Kalimantan Barat, Bayas logging area above Samanja, 113°S, 1106'E, clearing of lowland rainforest, at light, 27.VII.1993 leg. O. MERKL, HHNM.

Paratypes: Same data as holotype, 3 females HHNM, SE Borneo, without date, leg. S.V. GRABOWSKY, 1 male 1 female HHNM, 2 males SMNS.

Description: Body dark ferrugineous, shagreened surface between clavate setation covered by a layer of agglomerations. Head uneven with clavate setation on tubercles; clypeus and genae swollen; eyes not prominent and slightly excavated by the genae; antenna with broad antennomeres, proportions of the antennomeres see Fig. 8, third antennomere not elongated, all antennomeres with clavate setation and antennomeres 9 and 10 distally with a complete brush of dense light sensilla; labrum shiny, with distinct transverse keel; mentum (Fig. 7) broad, of crescent-shape. Shape of pronotum see Fig. 6, disk flat, maximal width 1.6 times wider than medial length, lateral margins parallel, surface uneven by clavate setation on tubercles, medially near base with longitudinal impression, lateral parts of pronotum separated from disk; all margins unbordered, basal margin medially with groove for scutellum; pronotum without sexual dimorphism. Prosternal apophysis not projecting. Pro-, meso- and metasternum with clavate setation on tubercles as on dorsal surface; metasternum medially with a long longitudinal groove. Scutellum (Fig. 6) round, basal part surpassing anterior margin of elytra. Elytra (Fig. 6) 1.75 times longer than wide, sides parallel and tip equally rounded, lateral margin invisible in dorsal view; each elytron with 10 rows of punctures, third row with about 23 punctures, diameter of punctures somewhat smaller than interval, all intervals equal and with a single row of longitudinal tubercles bearing clavate setae, latter about as long as diameter of the punctures. Epipleuron not reaching elytral apex, missing beside last 2 visible abdominal sternites, unpunctured. Surface of all abdominal sternites somewhat uneven and with clavate setation on tubercles, last visible sternite (5th) with large punctuation between tubercles, punctures of same size as length of setae, last sternite unbordered. Tibiae sexually dimorphic: in males protibia (Fig. 9) with distinct medial teeth and metatibia (Fig. 10) somewhat bent and medially with dilatation; femora on all sides and tibiae on external sides with clavate setation, but tibiae on internal side with acute setation; proportions of tarsi see Figs 9–10, claw segment of all tarsi not prolonged, shorter than basal segments combined. Aedeagus see Fig. 11. Body length 4.1–4.5 mm.

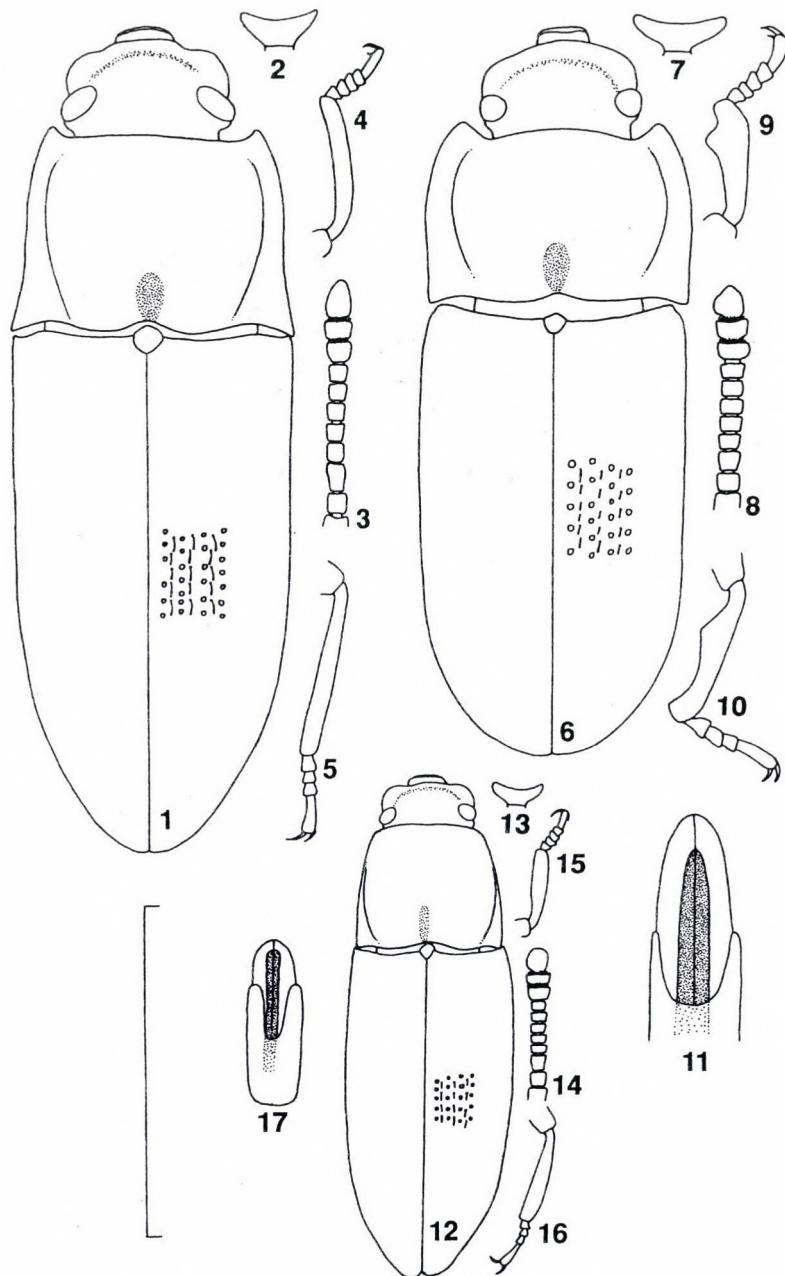
***Microbradymerus kazirangicus* sp. n.**

(Figs 12–17)

Holotype (male): India, Assam, Kaziranga, 75 m, 7.–9.V.1976 leg. W. WITTMER & C. BARONI-URBANI, NHMB.

Paratypes (sex not determined): Same data as holotype, 2 ex. HHNM, 10 ex. NHMB, 4 ex. SMNS.

Description: Body dark ferrugineous, shining surface between clavate setation covered by a layer of agglomerations. Head uneven with clavate setation on tubercles; clypeus and genae swollen; eyes not prominent and slightly excavated by the genae; antenna with broad antennomeres,



Figs 1–17. 1–5: *Microbradymerus assamicus* sp. n., female holotype 1 = dorsal view, 2 = mentum, 3 = antenna, 4 = protibia, 5 = metatibia; 6–11: *Microbradymerus merkli* sp. n., male holotype 6 = dorsal view, 7 = mentum, 8 = antenna, 9 = protibia, 10 = metatibia, 11 = aedeagus; 12–17: *Microbradymerus kazirangicus* sp. n., male holotype 12 = dorsal view, 13 = mentum, 14 = antenna, 15 = protibia, 16 = metatibia, 17 = aedeagus. Scale line: 2.0 mm (Figs 1–10, 12–16); 1.0 mm (Figs 11, 17)

proportions of the antennomeres see Fig. 14, third antennomere slightly elongated, all antennomeres with clavate setation and antennomeres 9 and 10 distally with a complete brush of dense light sensilla; labrum shiny, with distinct transverse keel; mentum (Fig. 13) broad, of crescent-shape. Shape of pronotum see Fig. 12, disk convex, maximal width 1.1 times wider than medial length, lateral margins slightly broadened backwards, surface uneven by clavate setation on tubercles, medially near base with longitudinal impression, basolateral parts of pronotum separated from disk; all margins unbordered, basal margin medially with groove for scutellum; pronotum without sexual dimorphism. Prosternal apophysis not projecting. Pro-, meso- and metasternum with clavate setation on tubercles as on dorsal surface; metasternum medially with a short longitudinal groove posteriorly. Scutellum (Fig. 12) round, basal part surpassing anterior margin of elytra. Elytra (Fig. 12) 2.00 times longer than wide, sides parallel and tip somewhat prolonged, lateral margin not seen in dorsal aspect; each elytron with 10 rows of punctures, third row with about 25 punctures, diameter of punctures somewhat smaller than interval, all intervals equal and without tubercles but with a single row of clavate setae, latter about as long as diameter of the punctures. Epipleuron not reaching elytral apex, missing beside last 2 visible abdominal sternites, unpunctured. Surface of all abdominal sternites even and with clavate setation, last visible sternite (5th) with large punctation between setation, punctures of same size as length of setae, last sternite unbordered. No sexual dimorphism of tibia, for shape of pro- and metatibia see Figs 15–16; femora on all sides and tibiae on external sides with clavate setation, but tibiae on internal side with acute setation; proportions of tarsi see Figs 15–16, claw segment of all tarsi not prolonged, shorter than or equal to basal segments combined. Aedeagus see Fig. 17. Body length 2.5–2.8 mm.

***Microbradymerus assamicus* sp. n.**

(Figs 1–5)

Holotype (female): India, Assam, Manas, 200 m, 23.X.1978 leg. C. BESUCHET & I. LÖBL, NHM.

Description: Body dark ferrugineous, shining surface between clavate setation covered by a layer of agglomerations. Head uneven with clavate setation on tubercles; clypeus and genae swollen; eyes not prominent and slightly excavated by the genae; antenna with broad antennomeres, for proportions of the antennomeres see Fig. 3, third antennomere slightly elongated, all antennomeres with clavate setation and antennomeres 9 and 10 distally with a complete brush of dense light sensilla; labrum shiny, with distinct transverse keel; mentum (Fig. 2) broad, of crescent-shape. Shape of pronotum see Fig. 1, disk flat, maximal width 1.4 times wider than medial length, lateral margins broadened backwards, surface uneven by clavate setation on tubercles, medially near base with longitudinal impression, lateral parts of pronotum separated from disk; all margins unbordered, basal margin medially with groove for scutellum; pronotum without sexual dimorphism. Prosternal apophysis not projecting. Pro-, meso- and metasternum with clavate setation on tubercles as on dorsal surface; metasternum medially with a short longitudinal groove posteriorly. Scutellum (Fig. 1) round, basal part surpassing anterior margin of elytra. Elytra (Fig. 1) 1.85 times longer than wide, sides parallel and tip somewhat prolonged, lateral margin not seen in dorsal aspect; each elytron with 10 rows of punctures, third row with about 27 punctures, diameter of punctures somewhat smaller than interval, alternating intervals 1, 3, 5 and 7 higher than others, all intervals without tubercles but with a single row of clavate setae, latter about as long as diameter of the punctures. Epipleuron not reaching elytral apex, missing beside last 2 visible abdominal sternites, unpunctured. Surface of all abdominal sternites even and with clavate setation, last visible sternite (5th) with large punctation between setation, punctures of same size as length of setae, last sternite unbordered. Sexual dimorphism of tibiae unknown, only female available, for shape of female pro- and metatibia see Figs 4–5; femora on all sides and tibiae on external sides with clavate setation,

but tibiae on internal side with acute setation; for proportions of tarsi see Figs 4–5, claw segment of all tarsi not prolonged, shorter than or equal to basal segments combined. Aedeagus unknown. Body length 4.8 mm.

* * *

Abbreviations: HNHM – Hungarian Natural History Museum, Budapest, NHMB – Naturhistorisches Museum, Basel; SMNS – Staatliches Museum für Naturkunde, Stuttgart.

Acknowledgements – I thank Dr. M. BRANCUCCI (Basel) and Dr. O. MERKL (Budapest) for the loan of material under their care and for the hospitality during my visits in the corresponding collections. Additionally, Dr. O. MERKL improved the manuscripts by valuable comments.

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FIRST RECORD OF ANTILLOCLADIUS SÆTHER FROM CONTINENTAL SOUTH AMERICA (CHIRONOMIDAE, ORTHOCLADIINAE)

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Antillocladius skartveiti sp. n. is described and figured as male imago based on specimens collected in the Pichincha Province in Ecuador. The genus *Antillocladius* SÆTHER, 1981, originally described from the British West Indies, now includes six species from North, Central and South America, and from China. A key to the male imagines is given.

Key words: Diptera, Chironomidae, Orthoclaadiinae, *Antillocladius*, new species, Ecuador

INTRODUCTION

The genus *Antillocladius* was erected by SÆTHER (1981) based on a single species from the British West Indies. Subsequently, SÆTHER (1982) described two species from the SE United States and emended the genus, and WANG and SÆTHER (1993) described two additional new species from Palaearctic and Oriental China. The genus thus comprises *A. antecalvus* SÆTHER, 1981 from St. Vincent, *A. arcuatus* SÆTHER, 1982 and *A. pluspilalus* SÆTHER, 1982 both from South Carolina, U.S.A., and *A. scapellatus* WANG & SÆTHER, 1993 from the Guangdong Province, China and *A. zhengi* WANG & SÆTHER, 1993 from the Hainan Province, China. Only the immatures of *A. pluspilalus* are known (SÆTHER 1984), showing that the genus is related to *Bryophaenocladus* THIENEMANN and *Gymnometriocnemus* GOETHGEBUER.

Besides *A. antecalvus* from St. Vincent, the only other record of the genus from the Neotropical region is that of *A. pluspilalus* from Nicaragua (SPIES & REISS 1996). In the present paper, we describe a new species from Ecuador, which is the first *Antillocladius* species to be described from continental South America.

METHODS AND MATERIAL

The material examined was mounted on slides following the procedure outlined by SÆTHER (1969). The general terminology follows SÆTHER (1980). The measurements are given as ranges followed by a mean.

The holotype and four paratypes of *Antillocladius skartveiti* sp. n. are deposited in the Museum of Zoology, Bergen, Norway (ZMBN); one paratype is deposited in the collection at the Instituto de Biología, U.N.A.M., México (IBUNAM), and one in the Zoologische Staatssammlung, Munich, West Germany (ZSM).

SYSTEMATIC PART

***Antillocladius skartveiti* sp. n.**

(Figs 1–6)

Holotype: male, Ecuador: Pichincha Province, near Paschocha Reserve, 3000 m a.s.l., 4. II. 1997, sweep net, leg. JOHN SKARTVEIT (ZMBN No.: 301).

Paratypes: 6 males, Ecuador: Pichincha Province, Quito, Parque Metropolitano, 2850 m a.s.l., 6. II. 1997, sweep net, leg. JOHN SKARTVEIT.

Diagnostic characters: See key.

Etymology: Named after Dr. JOHN SKARTVEIT, who collected the specimens.

Description: Male imago ($n = 5-7$). – Total length 2.17–2.33, 2.25 mm. Wing length 1.36–1.51, 1.43 mm. Total length / wing length 1.50–1.63, 1.57. Wing length / length of frontfemur 2.52–2.72, 2.60. Coloration brown, thorax dark brown, tarsi of all legs light brown.

Head (Fig. 1). AR 0.62–0.72, 0.68; ultimate flagellomere 276–332, 308 μm long. Temporal seta 7–11, 8; including 2–4, 2 inner verticals; 1–2, 2 outer verticals; and 3–6, 3 postorbitals. Clypeus with 6–8, 7 setae. Tentorium 99–110, 104 μm long; 14–17, 15 μm wide at sieve pore; stipes 91–110, 98 μm long; 19–25, 22 μm wide. Lengths of palp segments in μm : 21–23, 22; 39–45, 43; 94–98, 96; 88–96, 91; 106–115, 111. Third palpal segment with 2–3, 2 sensilla clavata subapically, longest 11–14, 12 μm long.

Thorax (Fig. 2). Anteprenotum with 2–3, 2 seta. Dorsocentrals 6–9, 7; acrostichals 8–11, 10, all scalpellate starting some distance from anterior end; prealars 3; supraalars 1. Scutellum with 4–7, 5 setae.

Wing (Fig. 3). VR 1.39–1.49, 1.43. R_{2+3} ends 1/2 of distance between R_1 and R_{4+5} . Costal extension 91–117, 108 μm long. Brachiolium with 1 seta; R with 7–16, 11; R_1 with 0–3, 2; R_{4+5} with 8–13, 11; M_{1+2} with 26–35, 30; M_{3+4} with 1–3, 2; C extension in addition to marginal fringe with 7–11, 9 seta. Wing membrane with 65–94, 67 setae in cell r_{4+5} ; 42–56, 50 in m_{1+2} ; 8–21, 15 in m_{3+4} . Squama with 2–3, 3 setae.

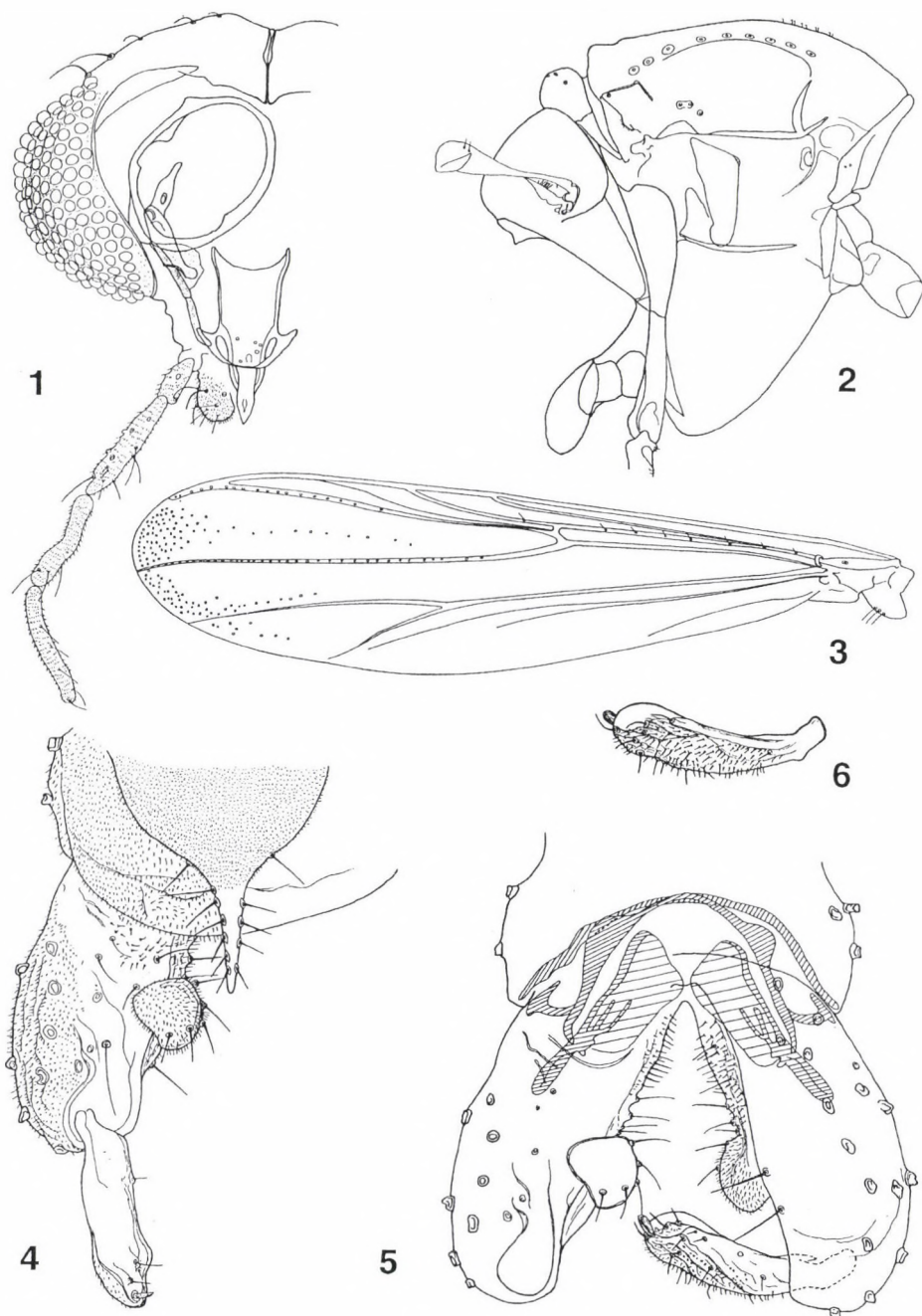
Legs. Spur of front tibia 43–50, 47 μm long; spurs of middle tibia 32–35, 34 μm and 19–25, 22 μm long; of hind tibia 40–47, 43 μm and 22–28, 24 μm . Width at apex of front tibia 32–34, 33 μm ; of middle tibia 30–33, 32 μm ; of hind tibia 35–41, 38 μm . Hind tibial comb with 11–12, 12 setae; shortest setae 19–25, 22 μm long; longest setae 30–40, 34 μm long. Lengths (in μm) and proportion of legs:

	fe	ti	ta ₁	ta ₂
p ₁	523–572, 551	588–637, 607	417–482, 454	241–253, 247
p ₂	539–596, 566	539–613, 575	237–253, 247	131–139, 133
p ₃	605–654, 619	629–703, 662	335–376, 359	172–204, 186
	ta ₃	ta ₄	ta ₅	
p ₁	151–172, 160	82–106, 93	41–53, 46	
p ₂	90–102, 94	53–57, 56	33–38, 35	
p ₃	139–163, 151	65–74, 68	37–49, 42	
	LR	BV	SV	BR
p ₁	0.68–0.79, 0.75	2.88–3.03, 2.94	2.46–2.72, 2.54	1.95–2.41, 2.21
p ₂	0.42–0.48, 0.43	4.18–4.68, 4.34	4.48–4.74, 4.60	3.17–3.56, 3.44
p ₃	0.51–0.58, 0.54	3.57–3.88, 3.67	3.38–3.86, 3.60	3.59–4.71, 4.22

Hypopygium (Figs 4–6). Anal point 37–47, 43 μm long; 14–17, 16 μm wide at base; with 10–14, 13 strong, lateral setae, void of macrotrichia except at base; occasionally with 2 additional, strong setae on margin of tergite IX distinctly above base of anal point; laterosternite IX with 6–7, 7 setae. Phallapodeme 62–76, 69 μm long. Transverse sternapodeme arcuate, with rounded oral projections; 46–65, 58 μm long. Gonocoxite 144–162, 153 μm long; with well developed, rounded, set-off inferior volsella. Gonostylus 70–80, 75 μm long; megaseta 8–11, 10 μm long. HR 1.94–2.17, 2.06; HV 2.75–3.22, 2.99.

DISCUSSION

The holotype of *A. skartveiti* sp. n. was netted in the vegetation along a wet roadside in an area with pastures, while the paratypes were netted in a ravine with seepage, all at high elevation sites. SÆTHER (1984) showed that the immatures of *A. pluspilalus* are limnic and not semiterrestrial as in the related genera *Bryophaenocladus* and *Gymnometriocnomus*. *A. antecalvus* from St. Vincent was collected in Malaise traps near rivers and at a hydrostation weir, while the two species from South Carolina were collected from seepage areas and at the margin of streams (SÆTHER 1984). The Chinese species were both taken in light traps in mountainous areas in Southern China and on the Island of Hianan (WANG & SÆTHER 1993).



Figs 1–6. *Antillocladius skartveiti* sp. n., holotype, male imago: 1 = head, 2 = thorax, 3 = wing, 4 = anal point and dorsal aspect of left gonocoxite and gonostylus, 5 = hypopygium with anal point and tergite IX removed, left dorsal aspect, right ventral aspect, 6 = gonostylus, dorsal aspect

KEY TO MALE IMAGES OF ANTILLOCLADIUS SÆTHER

1. Wing membrane with numerous setae apically in cells r_{4+5} , m_{3+4} and m_{4+5} 2
 - Wing membrane bare or with a few, weak setae apically in cell r_{4+5} 4
2. Virga well developed 3
 - Virga absent (Fig. 5); Ecuador **A. skartveiti** sp. n.
3. Virga consisting of 4 spines 60–68 μm long, all acrostichals hairlike, squama with 5–6, 6 setae (SÆTHER 1982, Fig. 6); U.S.A., Nicaragua *A. pluspilalus* SÆTHER
 - Virga consisting of 2 subequal spines 26–33, 28 μm long; posterior acrostichals scalpellate; squama with 8–13, 10 setae (WANG & SÆTHER 1993, Fig. 1); China *A. scalpellatus* WANG et SÆTHER
4. Virga absent 5
 - Virga well developed, consisting of 2 subequal spines 26 μm long (WANG & SÆTHER 1993, Fig. 2); China *A. zhengi* WANG et SÆTHER
5. Transverse sternapodeme nearly straight, phallapodeme 52–64 μm long, leg ratio of front leg 0.74–0.77 (SÆTHER 1981, Fig. 2); St. Vincent *A. antecalvus* SÆTHER
 - Transverse sternapodeme arcuate, phallapodeme 79–98 μm long, leg ratio of front leg 0.65–0.71 (SÆTHER 1982, Fig. 5); U.S.A. *A. arcuatus* SÆTHER

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SASACRICOTOPUS, A NEW ORTHOCLAD GENUS FROM JAPAN (DIPTERA, CHIRONOMIDAE)

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Diagnoses are given and phylogenetic position discussed for a new genus of orthoclads, *Sasacricotopus*. *Sasacricotopus* with the single included species *Nanocladius jintusecundus* SASA, 1990, apparently belongs in the *Nanocladius* group of genera but lacks acrostichals, pulvilli and plate-like superior volsellae.

Key words: Diptera, Chironomidae, Orthoclaadiinae, *Sasacricotopus*, male imago, Japan

INTRODUCTION

When one of us (O. A. S.) was preparing a key to orthoclads for the Manual of Palaearctic Diptera the species described from Japan by SASA and allies were checked from the literature. It was discovered that several species did not belong in their assigned genera. The types of these species subsequently were re-examined (by T. K.). Except for one species, *Nanocladius jintusecundus* SASA, 1990, other species could at least tentatively be assigned to genera. This species is here assigned to a new separate genus *Sasacricotopus*.

METHODS AND MORPHOLOGY

Morphological nomenclature follows SÆTHER (1980). The measurements are given as ranges followed by a mean when 4 or more measurements are made, followed by the number measured in parentheses (n).

Sasacricotopus gen. n.

Type species: *Nanocladius jintusecundus* (SASA, 1990: 37) by monotypy and present designation.

Diagnostic characters: The male imagines are separable from other Orthoclaadiinae except *Nanocladius* KIEFFER and *Doncricotopus* SÆTHER by having

hairy, reniform eyes; bare anal point; bare wing, setose squama; antenna without strong subapical seta; straight gonostylus; and no virga. It differs from *Nanocladus* and *Doncricotopus* in lacking acrostichals, pulvilli and plate-like superior volsella; having costa well extended and Cu_1 slightly sinuate, a stronger developed anal point, a large rectangular or linguliform inferior volsella, and tergite IX with a dark setose anteriomedian area.

Etymology: Named in honour of Dr. MANABU SASA, the prolific doyen of Japanese chironomids, and *Cricotopus*, from Greek - *krikotos*, made of rings, and *opos*, the eye, commonly used in the Orthocladiinae.

Male imago. Moderately sized species, wing length about 1.3–1.6 mm.

Eye densely hairy, reniform, without dorsomedian elongation, not protruding. Antenna with 13 flagellomeres; fully plumed; groove beginning at flagellomere 3; sensilla chaetica present on flagellomeres 2, 3 and 13; apex without apical seta; AR about 1.0. Palpomeres normal; palpomere 3 with lanceolate sensilla clavata. Temporals few, verticals long and strong, postorbitals apparently absent. Tentorium and stipes normally developed. Cibarial pump with anterior margin concave. Clypeus with few setae.

Anteprenotal lobes slightly narrowed medially, lateral anteprenotals present. Humeral pits small. Acrostichals absent, dorsocentrals and prealars few, supraalars absent. Scutellum with few setae. Preepisternum bare.

Wing membrane without setae, with very fine punctuation. Anal lobe present, but not protruding. Costa well extended; R_{2+3} running medially between R_1 and R_{4+5} ; R_{4+5} ending distal to end of M_{3+4} ; Cu_1 slightly sinuous; postcubitus and anal vein both ending distal to FCu; FCu slightly distal to RM. Brachiolum with 1 seta, other veins bare. Squama with few setae.

Tibial combs and spurs normal; tarsal pseudospurs, sensilla chaeticae and pulvilli absent.

Tergites and sternites with setae mostly concentrated to anterior half.

Anal point long and strong, slightly tapering, without setae and microtrichiae except at base. Dark setose patch present far anterior of base of anal point. Sternapodeme nearly semi-circular. Phallapodeme and aedeagal lobe well developed. Virga absent. Gonocoxite well developed; inferior volsella rectangular to linguliform, apparently no superior volsella. Gonostylus straight, widest in basal third; crista dorsalis preapical, long but low; megaseta normal.

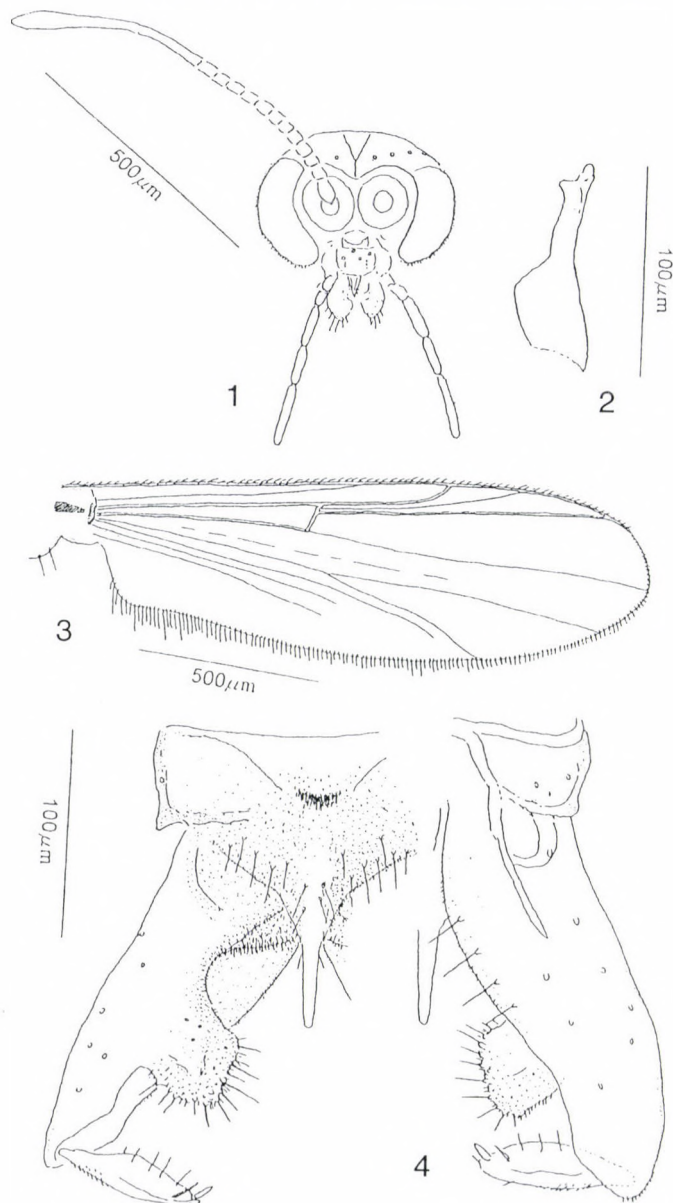
Female and immatures unknown.

SYSTEMATICS

In the key to Holarctic male Orthocladiinae (CRANSTON *et al.* 1989) will key to *Sublettiella* SÆTHER, to *Nanocladus* if the absence of plate-like superior volsella and non-protruding eyes are disregarded.

Sublettiella has a relatively coarse punctuation of microtrichiae on the wing membrane; pulvilli; short, triangular anal point; virga; and no temporal setae, and probably is not closely related. Furthermore, *Sublettiella* is wrongly placed in the key of CRANSTON *et al.* (1989) which states that there are no pulvilli and no virga, while the correct description says that the pulvilli are distinct, but not large; and that the virga consists of few short spines.

Sasacricotopus has a setose patch anterior to the base of the anal point which may correspond to the plate present in *Doncricotopus* SÆTHER and indicated in some *Nanocladius*, but much further anterior. We, thus, find it most likely that *Sasacricotopus* belongs in the *Nanocladius* group of genera.



Figs 1–4. *Sasacricotopus jintusecundus* (SASA), male imago: 1 = head, 2 = tentorium, 3 = wing, 4 = hypopygium

Sasacricotopus jintusecundus (SASA, 1990)
(Figs 1–4)

Nanocladius jintusecundus SASA, 1990: 37; SASA et OKAZAWA 1991: 56.

Material examined. JAPAN: Toyama-ken, Toyama-shi, Jintsu R., 13 XI 1989, 5 ♂, holotype and paratypes, M. SASA (A 211: 16–20); Toyama-ken, Toyama-shi, Joganji R., mainstream at Shinjogan Bridge, 25.X.1990, 1 ♂, M. SASA (A 219:07).

Diagnostic characters. – See generic diagnosis.

Male imago ($n=4-6$ except when otherwise stated). The species has been well described by SASA (1990) and SASA et OKAZAWA (1991), but the descriptions can be supplemented in a few details.

Head (Fig. 1). AR 0.97–1.03, 1.02. Temporal setae 4–5, 4; including 3 inner verticals; and 1–2, outer verticals. Tentorium (Fig. 2) 100–120 μm (3) long; 24–35 μm (2) wide. Stipes (Fig. 1 A) 95–110 μm (3) long. Palpomere lengths in mm: 20–25, 24; 30–45, 38; 70–80, 78; 70–80, 76; 120–150, 135. Third palpomere with 3–4, 3 sensilla clavata 7 μm long.

Wing (Fig. 3). C extension 70–80, 77 μm long.

Legs. Sensilla chaeticae absent. Lengths (in μm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p1	500–575, 545	600–710, 661	310–375, 348	210–230, 222	150–170, 158	80–105, 96
p2	550–620, 591	550–615, 586	230–250, 242	150–160, 153	110–140, 124	70–80, 76
p3	590–660, 620	640–700, 653	300–325, 309	175–200, 191	150–175, 161	80–95, 84
	ta ₅	LR	BV	SV	BR	
p1	70–80, 73	0.52–0.58, 0.53	2.51–2.98, 2.81	1.16–1.38, 1.31	2.0–2.1 (3)	
p2	65–70, 69	0.40–0.42, 0.41	3.12–3.55, 3.36	1.61–1.83, 1.76	1.8–2.3, 2.0	
p3	70–80, 75	0.46–0.50, 0.47	3.00–3.18, 3.10	1.51–1.58, 1.56	2.1–3.2, 2.6	

Hypopygium (Fig. 4). Anal point 100–113, 109 μm long; tergite IX with about 6–9, 7 setae to each side of anal point; laterosternite IX with 2–4, 3 setae. Phallapodeme 60–70, 63 μm long; transverse sternapodeme 58–60 μm (3) long. Gonocoxite 165–200, 185 μm long. Gonostylus 70–80, 73 μm long. HR 2.36–2.83, 2.55.

* * *

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Catalogue of Palaearctic Diptera

edited by Á. SOÓS and L. PAPP

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Contents: Explication to distribution. Type-species designations in Volume 13. New name proposed in Volume 13. Families: Anthomyiidae (Á. DELY-DRASKOVITS). Rhinophoridae (B. HERTING). Tachinidae (B. HERTING and Á. DELY-DRASKOVITS). Bibliography. Index.

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MOLLERIELLA, A NEW TERRESTRIAL ORTHOCLAD GENUS FROM THE NETHERLANDS (DIPTERA: CHIRONOMIDAE)

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Mollerietta calcarella gen. et sp. n., a terrestrial orthoclad from the Netherlands, is described as male and female imago. The genus share bare eyes, hairy wings, setae on squama, extended costa, and R_{4+5} ending proximal to end of M_{3+4} with *Paraphaenocladius* THIENEMANN. It differs from *Paraphaenocladius* in lacking dorsomedian eye extension, acrostichals and distinct hind tibial comb and in having very weak tibial spurs. Its phylogenetic position apparently is either in the *Heterotrissocladius* group of genera or near *Heterotanytarsus* SPÄRCK.

Key words: Diptera, Chironomidae, Orthocladiinae, terrestrial, *Mollerietta*, the Netherlands

INTRODUCTION

Terrestrial chironomids are considered as good bio-indicators of environmental changes. However, a complete survey of their taxonomy and ecology has not been published since STRENZKE (1950). MOLLER PILLOT (1994) is attempting to fill the widest gaps in our present knowledge and has started a survey in collaboration with several other workers. As part of this survey several mini-traps have been set up in different areas of the Netherlands. One of these traps in addition to a parthenogenetic *Neozavrelia* REISS contained a new and interesting genus of the subfamily Orthocladiinae which he sent us for description. The new genus is described below.

METHODS AND TERMINOLOGY

The general terminology follows SÆTHER (1980). The specimens were mounted on slides in Canada balsam following the procedure outlined in SÆTHER (1969). In the figures of the male genitalia the dorsal view is shown to the left, the ventral aspect and apodeme to the right. The measurements are given as ranges followed by a mean when 4 or more measurements are made, followed by the number measured in parentheses (n). The counts of setae on the wing veins include both dorsal and ventral setae, those standing at the margin of a vein are regarded as belonging to the vein.

The holotype male and the female paratypes are deposited in the Museum of Zoology, University of Bergen Norway (ZMBN).

Mollerietta gen. n.

Type species: *Mollerietta calcarella* sp. n. by monotypy and present designation.

Diagnostic characters: The male imagines are separable from other Orthoclaadiinae except *Paraphaenocladus* THIENEMANN by having bare eyes, hairy wings, setae on squama, extended costa, and R_{4+5} ending proximal to end of M_{3+4} . It differs from *Paraphaenocladus* in lacking dorsomedian eye extension, acrostichals and distinct hind tibial comb and in having very weak tibial spurs.

Etymology: Named in honour of our friend and colleague Dr. H. K. M. MOLLER PILLOT, Tilburg, The Netherlands, the collector of the type specimens, and the Latin diminutive *-ella*, commonly used in the Orthoclaadiinae.

Male imago. Small species, wing length less than 1.5 mm.

Eye bare, relatively small, reniform, without dorsomedian elongation. Antenna with 13 flagellomeres in male, 5 in female; fully plumed; groove beginning on flagellomere 3; sensilla chaetica present on flagellomeres 2, 3 and 13; apex with a strong and straight apical seta; AR lower than 1.0. Palpomeres normal; palpomere 3 with 2 lanceolate sensilla clavata. Temporals well developed, inner verticals, outer verticals, and postorbitals all present. Tentorium and stipes normally developed. Cibarial pump with anterior margin shallowly concave, cornua well developed. Clypeus with several setae.

Anteprenotal lobes not reduced medially, with lateral anteprenotals. Without scutal tubercle, hump or microtrichial tuft. Acrostichals absent; dorsocentrals numerous, starting just behind anteprenotum, in up to 4 rows; several prealars; supraalars absent. Scutellum with setae transversely uniserial with a few additional median setae. Preepisternum with several minute setae in dark spots.

Wing cuneiform, costa moderately extended, R_{4+5} ending well proximal to end of M_{3+4} , costa ending above or slightly proximal to end of M_{3+4} , R_{2+3} running and ending close to R_{4+5} ; VR high, Cu_1 nearly straight, postcubitus ending below or slightly distal to cubital fork, anal vein ending distal to cubital fork. All veins and cells with numerous setae, latter narrowly scale-like. Squama with few setae in fringe. Sensilla campaniformia about 10 both basally and apically on brachiolium, 3 below setae on brachiolium; 1 present basally on subcosta, and apically on R at RM.

Front leg ratio only slightly lower than 1.0. Some setae on legs narrowly scale-like. Tibial comb absent, but there may be a row of 3–4 weak straight apical setae which may represent a vestigial comb. Tibial spurs strongly reduced, thin and weak, with at most a couple of basal hair-like denticles on longer spurs. Tarsal pseudospurs, sensilla chaetica and pulvilli absent.

Tergites with basal, marginal and median setae. Sternites with uni- to multi-serial rows of median setae with lateral rows of few setae.

Male anal point parallel-sided, very slightly wider near rounded apex, bare, with a few setae posterolaterally of base, no further setae on tergite IX, laterosternite IX with several setae. Sternapodeme forming almost a complete semicircle with strongly concave transverse sternapodeme and very weak oral projections. Phallapodeme and aedeagal lobe normally developed. Apparent virga a single triangular scale. Gonocoxite well developed; inferior volsella well developed, triangular, with straight posterior margin; no superior volsella. Gonostylus normal, widest at about 3/4 of length, megaseta normal.

Female genitalia with evenly curved gonocoxapodemes meeting anterior of vagina. Gonocoxite well developed with several setae. Tergite IX strongly divided with several setae. Segment X normal. Postgenital plate weak, indistinct, bluntly triangular. Cercus moderately sized. Gonapophysis VIII divided into large ventrolateral lobe with anteriomedian extension covering base of nar-

row dorsomesal lobe. Apodeme lobe indistinct. Coxosternapodeme evenly curved. Seminal capsules larger than cerci, ovoid, darkly sclerotized for most of their length; with broad, triangular neck. Spermathecal ducts with anterior loop and separate openings. Labia apparently large and bare.

Immatures unknown.

SYSTEMATICS

In the key to Holarctic male Orthoclaadiinae (CRANSTON *et al.* 1989) *Mollieriella* will key to *Paraphaenocladus* because of the wing venation. *Mollieriella*, however, do not appear to be particularly close to that genus since there are no acrostichals, the eyes are not extended, the tibial spurs are reduced, a tibial comb is lacking, Cu₁ is nearly straight, the straight apical seta on the antenna is well developed, and the anal point and the virga are of types not found in *Paraphaenocladus*. The female genitalia, however, are quite similar to those of *Paraphaenocladus* (SÆTHER & WANG 1995).

If the wing venation is ignored the male imago of *Mollieriella* will key to *Heterotanytarsus* SPÄRCK in CRANSTON *et al.* (1989) to which also the female imago will key in SÆTHER (1977). Although the gonapophysis VIII is interpreted as undivided in *Heterotanytarsus* by SÆTHER (1977) the genitalia are quite similar to those of *Mollieriella*.

Most of the trends used by SÆTHER (1975) for delineating the *Heterotrissocladus* group to which *Paraphaenocladus* belongs were based on the immatures. However, there are sufficient trends to show that *Mollieriella* if belonging in that group could only be placed near *Paraphaenocladus*.

An apical antennal seta is found in all genera of the *Pseudorthocladus* group (SÆTHER & SUBLETTE 1983), some plesiomorphic genera, genera near *Chaetocladus* KIEFFER, some genera of the *Parakiefferiella* group, and some of the *Smittia* group. The straight Cu₁ combined with the fringed squama exclude the last two groups for further consideration. Among the others only some members of the *Pseudorthocladus* group may have hairy wing and in this group only *Parachaetocladus* WÜLKER is lacking acrostichals. However, neither that genus nor any of the genera belonging in the above mentioned groups appear to be closely related to *Mollieriella*.

The immatures may dissolve the problem of the relationship of this new genus. However, as the genus is terrestrial its immatures are likely to be of reduced types and may not bring sufficient evidence about relationship. All in all two alternative placement appear likely, relatively isolated positions either in the *Heterotrissocladus* group or near *Heterotanytarsus*.

***Mollerella calcarella* sp. n.**

(Figs 1–12)

Type locality: The Netherlands: Bergen op Zoom

Type material. Holotype ♂, THE NETHERLANDS: Bergen op Zoom, banks of small lake, woodland, no vegetation, mini-traps 1 m from water, trap set 21.VIII.1996, emerged 27.IX–4.X.1996, H. K. M. MOLLER PILLOT (BZMN Type No. 312).

Paratypes: 5 ♀, same data as holotype.

Etymology. From the Latin *calcar*, spur, and the Latin diminutive *-ella*, referring to the strongly reduced tibial spurs.

Male imago (n = 2 except when otherwise stated).

Total length 1.94–2.01 mm. Wing length 1.25–1.26 mm. Total length/wing length 1.54–1.61. Wing length/length of front femur 2.32–2.33. Coloration brown to blackish brown with vittae nearly fused.

Head (Fig. 1). AR 0.37–0.39. Ultimate flagellomere 167–169 µm long, apical seta 64 µm (1) long. Temporal setae 10–12 including 3 inner verticals, 3–4 outer verticals, and 3–6 postorbitals. Clypeus with 15–25 setae. Tentorium 113–116 µ long, 21–23 µ wide. Stipes 116–120 µ long, 30–45 µ wide. Palpomere lengths (in µ): 23, 38, 107–116, 131, 176–180. Third palpomere with 2 sensilla clavata, 11 µ long.

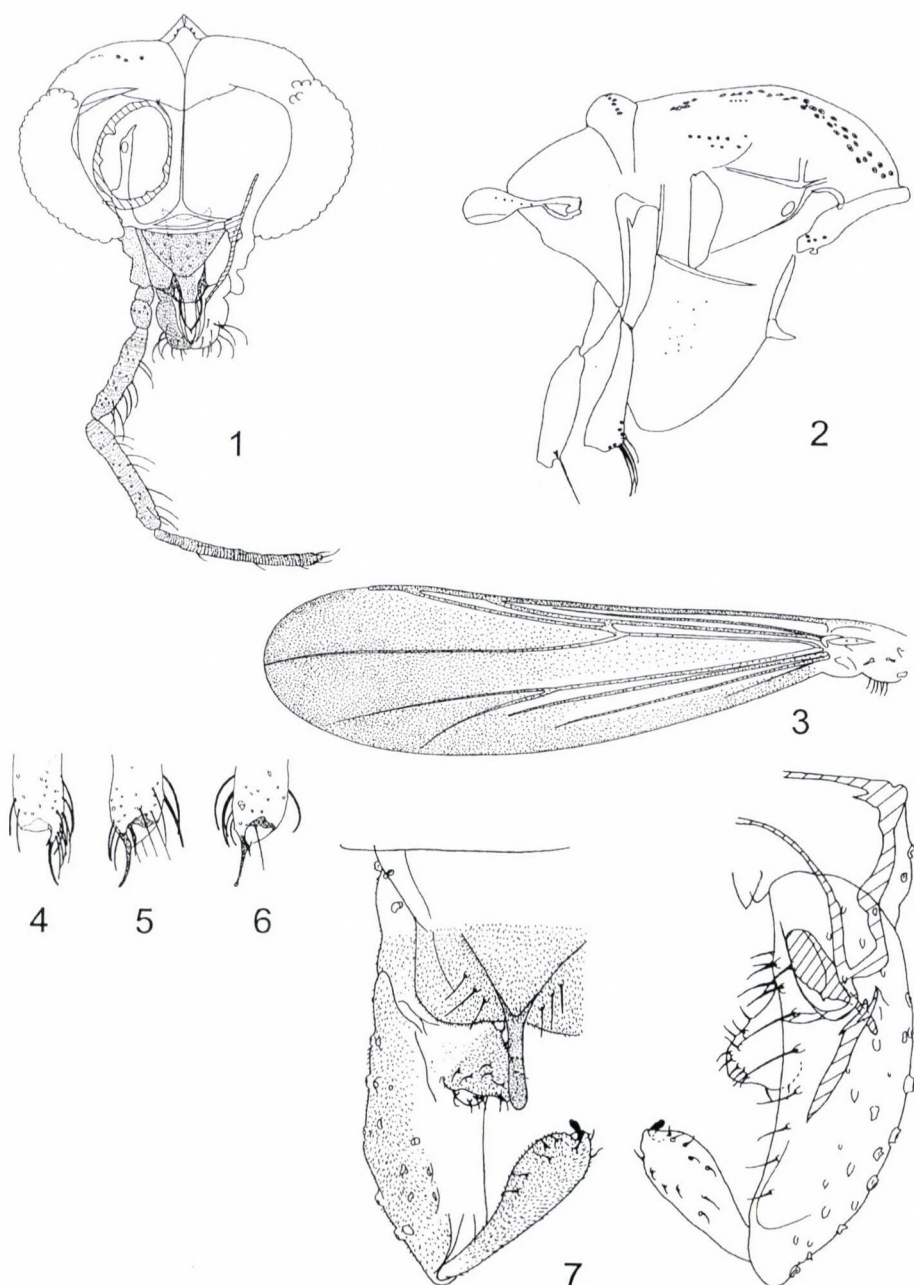
Thorax (Fig. 2). Antepronotum with 4 setae. Dorsocentrals 41–44, biserial in front, then triserial, uniserial above median anepisternum, and biserial posteriorly; 4 sensilla campaniformia in a row along dorsocentrals; prealars 9, biserial. Scutellum with 12 setae, transversely uniserial except biserial medially. Preepisternum with 4–12 minute median setae.

Wing (Fig. 3). VR 1.38. C extension 79–83 µ long. Brachiolum with 2 setae, costal extension with 19–20 non-marginal setae, subcosta with 53–71, R with 45–56, R₁ with 30–33, R₄₊₅ with 47–55 setae, RM with 2, M with 4, M₁₊₂ with 72–76, M₃₊₄ with 50–51, Cu with 46–48, Cu₁ with 31, PCu with 84–86, and An with 57–64 setae. Cell m with 66–78 setae, other cells each with more than 100 setae. Squama with 6 setae.

Legs. Spur of front tibia (Fig. 4) 26–32 µ long, spurs of middle tibia (Fig. 5) 30–34 and 15–19 µ long, of hind tibia (Fig. 6) 34–38 and 23 µ long. Width at apex of front and middle tibiae each 30–32 µ, of hind tibia 38 µ. Lengths (in µ, n=1–2) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	529–539	430–435	402–425	279–293	194–198	104–113	52–57
p ₂	539–562	473–482	321	161	113	71	38
p ₃	520–548	572–576	411–416	189–241	184–198	99	47
	LR	BV	SV	BR			
p ₁	0.93–0.98	1.85–2.16	2.29–2.39	3.2–3.6			
p ₂	0.67	3.57	3.25	5.2			
p ₃	0.72	2.69–2.81	2.66–2.70	5.4–5.8			

Hypopygium (Fig. 7). Tergite IX with 6–8 weak setae, all posterolateral of anal point; laterosternite IX with 7–8 setae. Phallapodeme 47–52 µ long; transverse sternapodeme 62 µ (1) long. Gonocoxite 140–149 µ long. Gonostylus 64–68 µ long. Virga 14 µ long, 12 µ (1) wide at base. HR 2.19–2.21, HV 2.96–3.03.



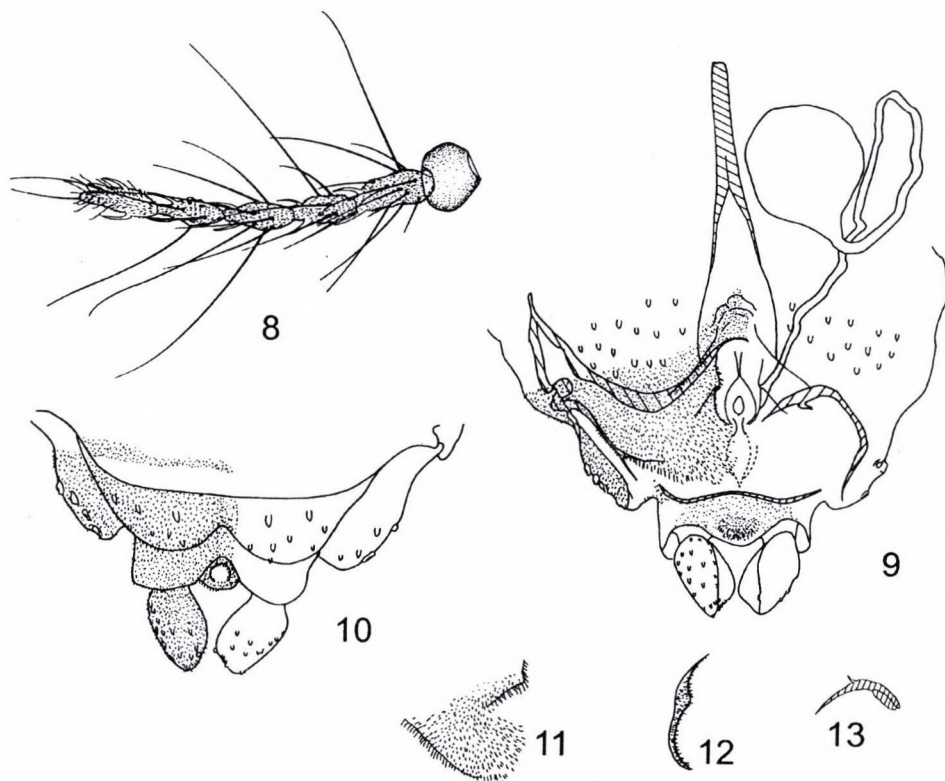
Figs 1–7. *Mollerietta calcarella* gen. n., sp. n., holotype, male imago: 1 = head, 2 = thorax, 3 = wing, 4–6 = apices of front to hind tibiae, 7 = hypopygium

Female imago ($n = 4-5$ except when otherwise stated). Total length 1.53–1.69, 1.59 μ .

Wing length 1.10–1.17, 1.14 mm. Total length/wing length 1.36–1.45, 1.40. Wing length/length of profemur 2.60–2.77, 2.67. Coloration as in male but with vittae distinct.

Head. Antenna (Fig. 8) with 5 flagellomeres. AR 0.26–0.28, 0.27. Flagellomeres lengths (in μ m): 64–94, 72; 49–68, 55; 56–79, 63; 47–68, 54; 56–79, 64. Subapical seta 49–64, 57 μ m long. Palpomere lengths (in μ m): 19–23, 22; 30–38, 33; 83–101, 91; 105–126, 121; 161–176, 169. Third palpomere with 2 apical sensilla clavata 17–19, 18 μ m long.

Wing. VR 1.28–1.39, 1.34. Costal extension 98–139, 121 μ m long. Brachiolium with 2 setae; costal extension with 26–45, 32 non-marginal setae; subcosta with 42–52, 48; R with 28–34, 33; R_1 with 20–27, 24; R_{4+5} with 42–63, 52; RM with 2; M with 4–5, 5; M_{1+2} with 45–75, 65; M_{3+4} with 44–66, 53; Cu with 30–40, 35; Cu_1 with 26–33, 31; PCu with 50–60, 55; and An with 39–44, 41 setae. Cell m with 49–78, 63 setae; other cells each with more than 100 setae. Squama with 6–8, 7 setae.



Figs 8–13. *Mollerietta calcarella* gen. n., sp. n., female imago: 8 = antenna, 9 = genitalia, ventral view, 10 = genitalia, dorsal view, 11 = ventrolateral lobe of gonapophysis VIII, 12 = dorsomesal lobe of gonapophysis VIII, 13 = apodeme lobe

Legs. Spur of front tibia 26–30, 28 μm long; spurs of middle tibia 30–32, 30 μm and 0–11, 4 μm long; of hind tibia 30–34, 32 μm and 11–15, 13 μm long. Width at apex of front tibia 26–32, 28 μm ; of middle tibia 26–36, 33 μm ; of hind tibia 34–38, 37 μm . Lengths (in μm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	406–444, 427	359–387, 361	194–213, 205	128–142, 134	128–142, 134	66–80, 75
p ₂	482–501, 493	416–454, 439	279–288, 284	132–142 (3)	90–99 (3)	52–57 (3)
p ₃	454–482, 472	487–529, 515	335–350, 345	170–194, 186	161–175, 164	66–85, 76
	ta ₅	LR	BV	SV	BR	
p ₁	43–47, 45	0.92–0.94, 0.93	2.40–2.59, 2.52	2.24–2.32, 2.29	2.0–3.6, 2.8	
p ₂	33 (3)	0.63–0.68, 0.65	3.67–3.81 (3)	3.23–3.36 (3)	3.8 (1)	
p ₃	38–47, 43	0.66–0.69, 0.67	2.73–2.97, 2.85	2.79–2.90, 2.86	3.2–5.7, 4.2	

Abdomen. Number of setae on tergite I 12–18, 16; on each of tergites II–VII 19–37, 29; on tergite VIII 19–26, 22. Number of setae on sternites I–VIII as: 0–6, 2; 4–25, 14; 14–39, 22; 17–39, 29; 23–32, 27; 25–33, 29; 17–30, 32; 26–34, 30.

Genitalia (Figs 9–12). Gonocoxite relatively large, with 6–10, 8 setae. Tergite IX clearly divided, with altogether 12–16, 14 setae. Cercus 43–47, 46 μm long. Seminal capsules 59–64, 61 μm long; 45–52, 48 μm wide; with 12 μm (1) long, triangular neck. Notum 64–69, 67 μm long.

ECOLOGY AND DISTRIBUTION

The species was collected by mini-traps from the banks of a small lake. It has been collected at two other localities in other parts of the Netherlands, in birch and alder scrub (H. K. M. MOLLER PILLOT pers. comm).

* * *

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TAXONOMY OF THE GENUS CTENOCERATODA VARGA, 1992 (LEPIDOPTERA, NOCTUIDAE) WITH THE DESCRIPTION OF SEVEN NEW SPECIES

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The taxonomy of the genus *Ctenoceratoda* is revised; diagnostic characters of five species groups are given; seven new species (*Ctenoceratoda lukhtanovi*, *C. peregovitsi*, *C. psychrogena*, *C. aksakal*, *C. anthracina*, *C. naryna* and *C. transalaica*) are described and illustrated. Four species have been transferred to *Polia* OCHSENHEIMER, 1816 with revised status: *P. subviolacea* LEECH, *P. ignorata* HREBLAY, *P. praecipua* STAUDINGER and *P. sublimis* DRAUDT. The taxonomic relationships of the new and closely related species are discussed. With 91 figures.

Key words: *Ctenoceratoda*, taxonomy, species groups, new species, revised status

INTRODUCTION

During the last few years a very rich material of Noctuidae has been collected in various parts of the former Soviet Union. Fortunately, the species of the genus *Ctenoceratoda* VARGA, 1992, hitherto scarcely represented in most collections, is well represented in this material. This material has been studied and compared with other important materials of *Ctenoceratoda* in several large European collections (see: Abbreviations). Thus, we provide here a review of all known species of the genus *Ctenoceratoda*, with a tentative grouping of species based on their phylogenetic relationships. The holotypes of the new species described here are deposited in the Department of Zoology of the Hungarian Natural History Museum but paratypes have also been preserved in other important public and private collections in Hungary.

Abbreviations: HNHM: Hungarian Natural History Museum, Budapest; ZIUD: Zoological Institute, L. Kossuth University, Debrecen, coll. Z. VARGA; PGy: coll. Peter GYULAI, Miskolc; MH: coll. M. HREBLAY, Érd; GR: coll. G. RONKAY, Budapest.

TAXONOMIC GROUPING OF CTENOCERATODA SPECIES WITH DIAGNOSES OF SPECIES-GROUPS

According to the genital characters of both sexes, the genus *Ctenoceratoda* belongs to a monophyletic group of hadenine genera, consisting of the following genera: *Polia* OCHSENHEIMER, 1816, *Ctenoceratoda* VARGA, 1992, *Pachetra* GUENÉE, 1841, *Tricheurois* HAMPSON, 1905 and *Haderonia* STAUDINGER, 1895. *Ctenoceratoda* can probably be regarded as the sister group of *Polia*. Important diagnostic, mostly apomorphic characters are as follows:

Male genitalia:

1. Cucullus and corona well-developed, with a distinct major seta on the ventral edge of the cucullus;
2. "Neck" of the cucullus elongate;
3. The constantly well-developed ampulla elongate and often of arched form;
4. Harpe flattened, plate-like, weakly sclerotized;
5. Ventral process of sacculus on the valva more or less elongate and often acute, but not dyssymmetrical;
6. Aedeagus long, arched with broad, strongly sclerotized triangular carina;
7. Vesica seminalis very long, tubular, curved and twisted with long, stripe-like distal brush of fine, needle-shaped and strongly sclerotized cornuti;

Female genitalia:

8. Ventral plate of the 8th sternite strongly sclerotized, broad and often bilobate; strongly attached to the ostium bursae. It probably serves as attaching surface of the valvae during copulation;
9. Ductus bursae long and strongly sclerotized;
10. Corpus bursae broad, globular; appendix bursae long, tubular.

The characters 1, 2, 3, 4 and 10 are synapomorphic for the entire group of genera mentioned above; characters 6 and partly 5 and 7 are synapomorphic with *Polia*; character 7 (partly) and characters 9, 11 proved to be autapomorphic for *Ctenoceratoda* only (see below). The symmetrical genitalic capsula, which caused BOURSIN (1964) to refer *Ctenoceratoda* species to *Haderonia*, probably represents a plesiomorphic character of limited taxonomic significance. Recently, two of the "large" *Haderonia* species (*culta* MOORE, 1881; *kalikotei* VARGA, 1992); have been transferred to *Polia* (HACKER 1997), which has proved to be correct. "*Haderonia*" *subviolacea* LEECH, 1900 and the newly described "*H.*" *ignorata* HREBLAY, 1996 belong, however, obviously to the same monophyletic group of species. Furthermore, also "*H.*" *praecipua* STAUDINGER, 1898 and "*H.*" *sublimis* DRAUDT, 1950, are closely related to them, thus they need to be transferred into the genus *Polia*. (New status: *Polia subviolacea*, *P. ignorata*, *P. praecipua* and *P. sublimis*.) If one accepts this suggestion, the genus *Polia* displays a

transition from the originally symmetrical male genitalia to the rather dyssymmetrical form. The species with symmetrical capsula have a more restricted range of distribution in SE Asia. On the other hand, as a rule, the species with some kind of specifically dyssymmetrical capsula are widely distributed in the Palaearctic or even in the Holarctic (MCCABE 1982).

Both *Polia* and *Ctenoceratoda* are rich in species, hence it is difficult to find good, diagnostic external characters. Most species are large or medium-sized moths. However, the genus *Ctenoceratoda* appears to be more ancestral than *Polia*. The male genitalia lack the dyssymmetrical, elongate form of the ventral saccular process of valvae, typical for the majority of *Polia* species. The genus seems to be exclusively Palaearctic with many strictly endemic species in arid high mountains of Central and Inner Asia, as opposed to *Polia*, where numerous species have an extended arboreal range within the Palaearctic, Nearctic or even Holarctic.

On the other hand, *Ctenoceratoda* species also have several autapomorphic characters. Such are e.g. the elongate and acute form of the forewings which is somewhat similar to that of *Cucullia* spp. (also the style of their flight is similar, according to field observations of the senior author), the very long, bipectinate antennae of the males, the specialized distal hair tufts of the females in the "*C. contempta*–*C. lupa*" species-group, indicating a special way of oviposition (supposedly similar to some lymantriids). The very sophisticated "lock-and-key" mechanism of the male and female genitalia proved to be the most important apomorphic character, which appears to be surprisingly uniform throughout the whole genus, with only minute specific differences. The taxonomic characterization of the species is based on external structural characters, e.g. male antenna, on the wing shape and wing patterns and on the characters of the genitalia of both sexes.

The larvae and life history of the *Ctenoceratoda* species are hitherto unknown, but based on field observations made by the senior author we suppose that, as a rule, they are linked to vegetation types characterized by *Eurotia* (Chenopodiaceae) species. This appears to be an important common character of *Ctenoceratoda* habitats in Kazakhstan, in the Pamir and Hindukush area and also in Mongolia.

DESCRIPTIONS OF THE NEW SPECIES

The new species are described according to their proposed taxonomic relationships. The taxa, closely related to the type species of the genus, *Ctenoceratoda sukharevae* are treated first. Then species related to *C. turpis* and those, belonging to the "*C. tancrei*–*C. thermolimna*" species-group are described; species

belonging to the "*C. khorgossi*" species-group are mentioned last. The species of the taxonomically very complex "*C. lupa*-*C. contempta*" species-group will not be discussed here, because we have not yet been able to study all the type materials which would be necessary for a serious taxonomic revision of this group.

Ctenoceratoda sukharevae-group

This group consists of the following species: *Ctenoceratoda longicornis* (GRAESER, 1892), *C. sukharevae* (VARGA, 1974), *C. juliannae* VARGA, 1992, *C. oxyptera* VARGA, 1992 and *C. lukhtanovi* sp. n.

Diagnosis: Relatively large moths, with very long bipectinate male antennae, very elongate forewings and full, regular markings. Male genitalia with relatively short and broad uncus, short and broad ampulla, relatively short and broad "neck" of cucullus. The species of this group have a very homogenous structure of the male genitalia with only minute differences, therefore we consider them to form a monophyletic species group. All species known so far occur usually strictly localised, in high mountains of Central Asia with extremely continental, arid climate.

***Ctenoceratoda lukhtanovi* sp. n.**

(Figs 1–2, 23, 41, 50–52, 82)

Holotype: male, Tadjikistan, Pamir area, Muzkol Mts, Ak-Baital pass, 4200 m, 19.07.1996, leg. LUKHTANOV, coll. P. GYULAI, deposited in HNHM.

Paratypes: four males and one female with the same data (colls PGy, GR, ZIUD); two males, Tadjikistan, E. Pamir, Pshart Mts, E. Pshart, 4200 m, 20–21.07.1996, leg. LUKHTANOV, coll. PGy. Slides: males, Nos 773 and 829 (GYULAI), female 6113 (RONKAY).

Diagnosis: This new species is easily recognized by external characters. The male antennae are very long, shortly bipectinate, the forewings are very elongate, the reniform spot is relatively large, almost quadrangular, the subterminal line is very fine with dark shadow on the inner side, lacking arrowheads. In the male genitalia, the most closely related species are *C. longicornis* GRAESER and *C. juliannae* VARGA. Distinctive characters are the longer uncus, the less convex dorsal margin of sacculus and the smaller, more globular form of ampulla in the male, and the quadratic papillae anales, very thin and long apophyses posteriores and very elongate, ribbed appendix bursae in the female.

Description: forewing length 17.0–19.5 mm (males) and 18 mm (female), wingspan 32.5–36 mm (males) and 36 mm (female).

Male: Head and thorax grey, with black-tipped hairs, often with pinkish shade on head. Antenna long, brown, bipectinate with short setae. Forewing elongate, triangular, ground colour light

brown with pinkish shade, but more greyish in two males. Ante- and postmedian lines double, relatively broad, wave-shaped, postmedian line crenulate and arched, with lighter filling. Orbicular and reniform spots regular, reniform spot relatively large, almost quadrangular, maculation slightly lighter than ground colour. Claviform spot obsolescent, elongate, bordered with scarce black scales exteriorly. Subterminal line very fine, with obsolescent dark brown shadow interiorly, without arrowheads. Medial field slightly darker than the field between postmedian and subterminal lines. Cilia dark brown or greyish brown with two very fine, ochreous lines. Hindwing brown or greyish brown; with very fine darker median and broad darker brown stripe exteriorly. Cilia ochreous, with very fine, brown line. Underside of wings homogeneous, light brown or light grey, weakly irrorated with fine black scales and often with pale pink colouration on costa. Shadow of postmedian line on forewing and of median line on hindwing well visible. Shadow of cellular lunule obsolescent. Cilia paler than ground colour with broad brown stripe; much lighter on hindwing.

Female similar to male, but antenna filiform with brown and white segments, ground colour more greyish, hindwing whitish grey with obsolescent markings.

Male genitalia (Figs 1a-b, 23): Uncus broad, short, triangular; tegumen normal; saccus relatively small; valva elongate, cucullus moderately large; setae of corona forming several rows, angular seta moderately strong; neck of cucullus broad; dorsal costa of sacculus slightly convex only with smooth surface; ampulla small, short, club-shaped; ventral processus of sacculus short, acute; juxta nearly equidiametral, pentagonal; aedeagus moderately long, arched; carina elongate; vesica relatively short, recurved; fascia of cornuti broad.

Female genitalia (Fig. 41): Papillae anales quadratic, obtuse terminally; apophyses posteriores very long and thin, angulate medially; apophyses anteriores thicker at base, thinner distally, weakly arched; ostium bursae laterally strongly sclerotized, ductus S-shaped, twice recurved, longitudinally ribbed distally, corpus bursae strongly ribbed longitudinally with two large signa, appendix bursae strongly elongate, strongly ribbed longitudinally.

Bionomics and distribution: The new species is known only from two localities of the E Pamirs in Tadjikistan. It occurs in rocky places in the subnival region (near 4200 m).

Etymology – The new species is dedicated to Dr V. LUKHTANOV, outstanding specialist of Asiatic butterflies and collector of the type material.

Taxonomic note – A further male has been collected north of the type locality of *C. longicornis* GRAESER (Kysil-Yart pass, between Transalai and Pamir). It is labelled as follows: Kyrgyzstan, Alai Mts, Archaty, 3700 m, 17.07.1996, leg. LUKHTANOV, coll. PGy; slide: No. 804 (GYULAI). It differs slightly from both *C. longicornis* and *C. lukhtanovi*. The less elongate shape and more concolorous pattern of forewings and also the genitalia (Fig. 2) are more similar to those of *C. longicornis* (Figs 3, 24). It probably represents a distinct taxon (subspecies of *C. longicornis*?, see Figs 53–54). However, based on this single specimen, it cannot be described yet, but is referred to this species provisionally. This is the westernmost occurrence of a taxon of the *C. sukharevae* species-group, which was also taken at high elevations (3700 m). It appears to be a very local and rare moth, considering that more than 120,000 noctuid moths have been collected in Kyrgyzstan in the last ten years; from these about 3,000 were taken at the locality of this single specimen.

Ctenoceratoda turpis species-group

This group consists of the following species: *Ctenoceratoda turpis* (STAUDINGER, 1900), *C. peregovitsi* sp. n., *C. psychrogena* sp. n. and *C. aksakal* sp. n.

Diagnosis: Medium-sized moths with moderately long and bipectinate antennae. Forewings are not extremely elongate, but apically acute; colouration nearly concolorous grey, marking regular, often obsolescent. Male coremata often lacking (exception: *C. aksakal*). In male genitalia: uncus long and narrow, ampulla long, "neck" of cucullus moderately long size of "head" varied. Because all species vary in wing colouration and pattern, the separation of the species is difficult according to these external characters. Differences in the pectination of the male antenna appear to be good specific characters. This group is most closely related to the next one.

***Ctenoceratoda peregovitsi* sp. n.**

(Figs 4–5, 25–26, 55, 83)

Holotype, male: Mongolia, Ömnögovî aimak, Mts Tost, 42 km WSW Gurt, 2450 m, 43°11'11"N, 100°36'60"E, 3.VI.1997, leg. L. LÖKÖS & L. PEREGOVITS (coll. HNHM).

Paratypes: a series of males and females with the same data as the holotype (coll. HNHM, P. GYULAI, G. RONKAY, Z. VARGA); 1 male and 5 females, Mongolia, Bajan Ölgîj aimak, leg. Z. KASZAB (coll. HNHM), 1 male, Mongolia, Bajan Ölgîj aimak, Möncharjchan, in the village, 30–31.07.1986, leg. et coll. P. GYULAI.

Slides: male, No. 794 (GYULAI), 1114 (VARGA), female 7032 (VARGA).

Diagnosis: The new species is allied to *C. turpis* STAUDINGER (Fig. 56). Despite of the almost uniform brownish-grey colouration of both sexes, it can be separated by some external features. The male antenna is very finely bipectinate, setae are fine and relatively short, their length about half compared to those of *C. turpis*. Last one-third part of the antenna is not bipectinate, only dentate. The spike-shaped, relatively long last segment of the palpus, the only slightly wave-shaped subterminal line with brown shadow exteriorly (lacking arrowheads !) also typify this new species. In the male genitalia the relatively small "head" of the cucullus, the thick, pointed ampulla and the very long, relatively narrow field of the fasciculate cornuti have been proven to be diagnostic characters.

Description, male: Forewing length 17–18.5 mm, wingspan 34.5–38 mm. Antenna dark brown, finely bipectinate, setae relatively short and fine, about last one-third of antenna only dentate. Last segment of palpus long, spike-shaped. Ground colour of body vestiture and of forewing dusty greyish-brown. All elements of wing pattern rather obsolescent. Maculation regular, concolorous with ground colour, with fine black scales bordered partially; reniform spot narrow, with two ochreous points internally. Ante- and postmedian lines fine, dark dusty brown, obscure; antemedian line wave-shaped, double, postmedian line simple, dentate. Subterminal line fine, ochreous, slightly wave-shaped, with brown shadow internally. Cilia brown, with ochreous line ba-

sally. Hindwing brown, marginal field slightly darker. Cilia ochreous with fine brown stripe. Underside of wings concolorous; forewing: light brown with ochreous suffusion; hindwing: whitish with brown suffusion. Shadow of wing patterns on hindwing visible only, very obsolescent.

Female similar to male but slightly larger (forewing length: 18–19 mm, wingspan: 37–38.5 mm), darker, markings slightly more obliterated, but with overlapping variations.

Male genitalia (Figs 4–5, 25–26): Uncus straight, elongate; margins nearly parallel. "Neck" of cucullus elongate, "head" of cucullus relatively small, triangular; ventral processus of sacculus acute. Vesica very long, distal part elongate; the very thin, needle-like, finely acute fasciculate cornuti forming long, narrow stripe. (Male genitalia of *C. turpis*: see Figs 9–10, 30).

Female genitalia: Ductus bursae relatively longer and broader (compared to *turpis*), S-shaped, curved twice; corpus bursae globular, appendix bursae very elongate, broader distally. (Female genitalia of *C. turpis*: Fig. 45).

Bionomics and distribution: The new species is known only from the Mongol and Govi Altai Mts, where it is a local but seemingly frequent species of the montane stony semi-deserts. It is a relatively early flying species. Fresh specimens were collected in June; all specimens collected in July are worn.

Etymology – The new species is dedicated to L. PEREGOVITS, lepidopterist of the Hungarian Natural History Museum, Budapest, who has organized several expeditions to Mongolia and discovered many interesting species in this area.

Ctenoceratoda psychrogena sp. n.

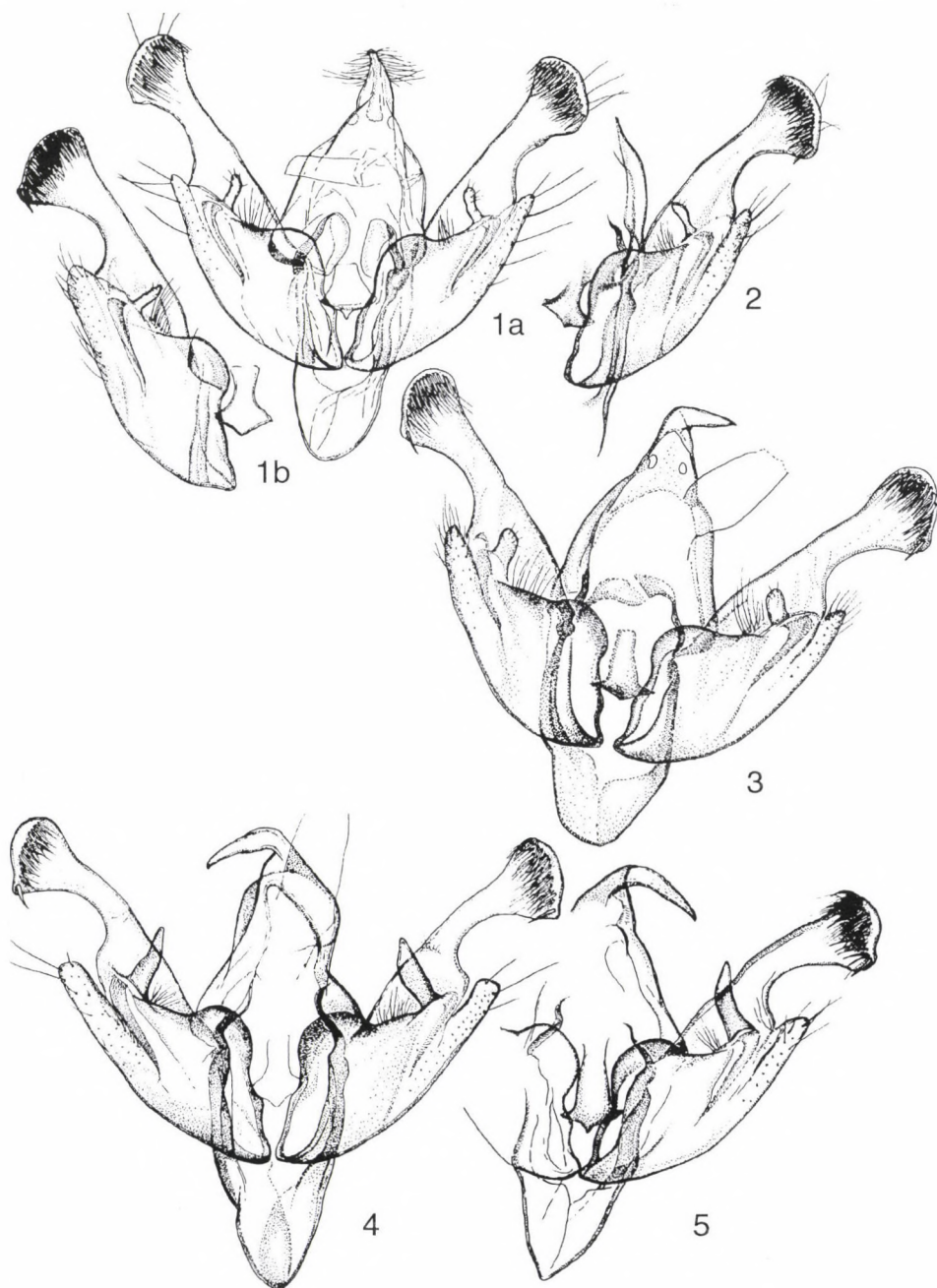
(Figs 6–8, 27–29, 42–44, 58–62, 84)

Holotype, male: Tadjikistan, E Pamir, Vakhanski Mts, 4200 m, 24.07.1996, leg. LUKHTANOV, coll. P. GYULAI, deposited in HHNM.

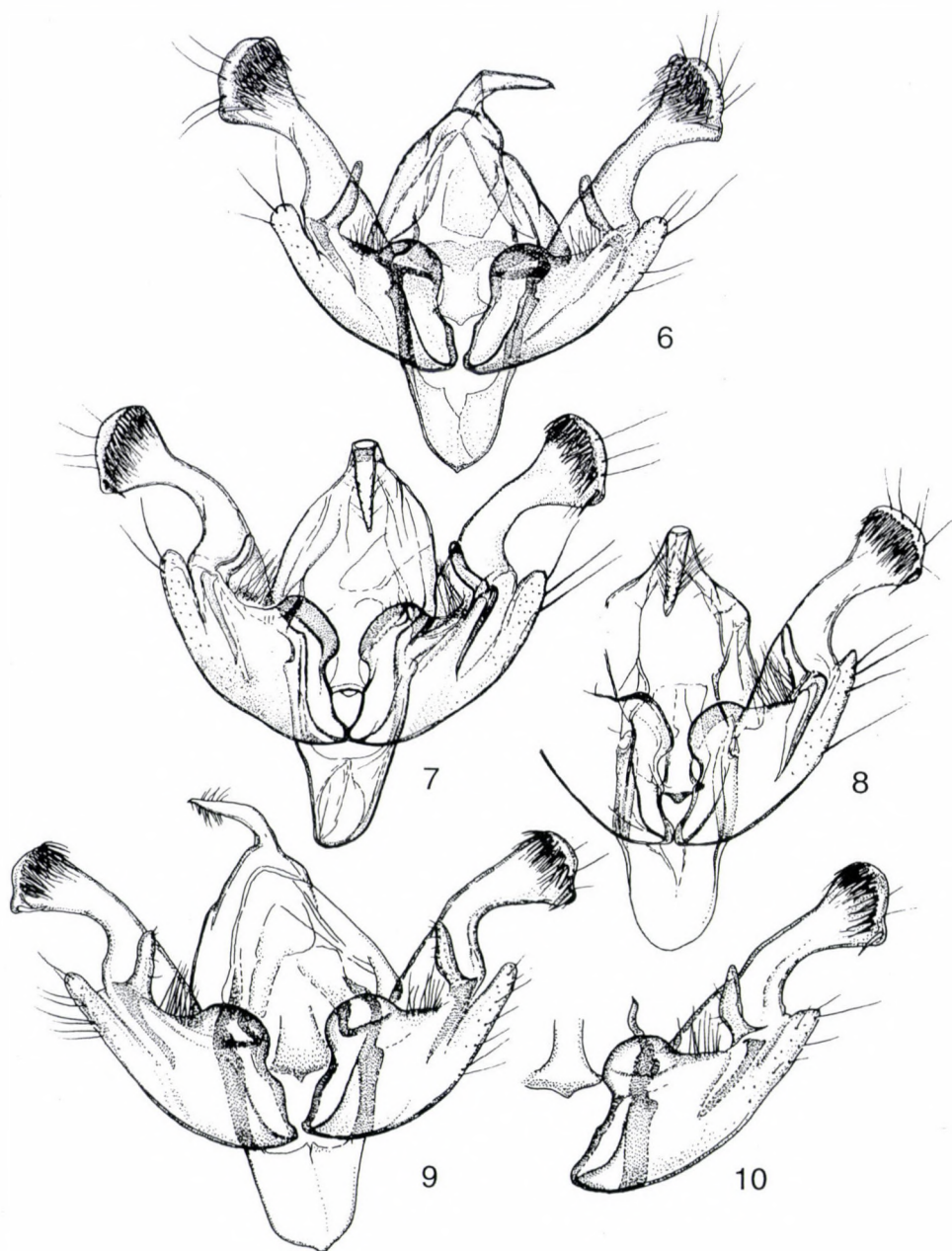
Paratypes: 3 males, with the same data; 25 males, Tadjikistan, E Pamir, Sarykolsky Mts, Dunkeldyk, 4300 m, 25–27.07.1996, leg. LUKHTANOV; 10 males and 7 females, Tadjikistan, E Pamir, Ak-Bura Mts, Tokhtomush, 4100 m, 22–23.07.1996, leg. LUKHTANOV; 1 male and 1 female, Tadjikistan, E Pamir, Pshart Mts, E Pshart, 4200 m, 20–21.07.1996, leg. LUKHTANOV; 9 males, 2 females, Tadjikistan, E Pamir, Alitshursky Mts, Su-Istyk, 3900 m, 22–23.07.1996, leg. LUKHTANOV; colls P. GYULAI, G. RONKAY, Z. VARGA, HHNM.

Slides: males, Nos 766, 768, 769, 807, 825, 834(1), 835(7), 836 (GYULAI); females, 6110, 6111, 6112 (RONKAY).

Diagnosis: A relatively small species with considerable individual variation. Forewing proportionally broader and shorter, less elongate and acute than in *C. turpis* and *C. peregovitsi*. Respecting the external features, only the dark, less contrasting specimens of the new species are similar to *C. turpis* and dissimilar to *C. peregovitsi* sp. n. and *C. aksakal* sp. n. In these cases, the smaller size, the shorter, more contrasting forewings and the broader, more contrasting cilia refer to *C. psychrogena* sp. n. From the last two ones, the males of the new species are to be separated very easily by the male antenna. The antenna of *C. peregovitsi* are very finely bipectinate, with very short setae. The antenna of *C. aksakal* are also much slender but setae are black and thick. Forewing of *C. peregovitsi* is very elongate, apically acute, dark greyish-brown, reniform spot weak, elongate. *C.*



Figs 1–5. Male genitalia of *Ctenoceratoda lukhtanovi* sp. n. 1a, b = Pamir, Muzkol Mts, slides 773 and 829 (GYULAI), paratypes; 2 = valva, Kyrgyzstan, Alai Mts, slide 804 (GYULAI); 3 = *C. longicornis* GRAESER, Kizyl-Yart, slide MB 307 (BOURSIN), holotype; 4–5 = *C. peregovitsi* sp. n., Mönchajrchan, slides 794 (GYULAI), 1114 (VARGA), paratypes



Figs 6–10. Male genitalia of *Ctenoceratoda* species: 6 = *C. psychrogena* sp. n., Pamir, Vakhanski Mts, slide 825, holotype, 7–8 = *C. psychrogena* sp. n., Sarykol Mts, Ak-Bura Mts, slides 768, 769 (GYULAI), paratypes; 9–10 = *C. turpis* STAUDINGER, "Tien-Shan", slides 4845 (VARGA), N 583 (BOURSIN, ZSM)

aksakal differs – beside the setae of the antennae – by the very long antennae, by the silvery ground colour of the forewing (spots are also filled with silvery scales and they are not lighter than ground colour, in contrast to *C. psychrogena*) and by the broad dark shadow of the median line on the underside of hindwing. As regards the male genitalia, the most closely related species is *C. turpis*, but the “head” of the cucullus is proportionally larger, the ampulla is longer and stronger; distal part of vesica and field of fasciculate cornuti are shorter and broader than in the closely related species.

Description: Forewing length 14.5–17.5 mm (male) and 14.5–17.0 mm (female), wingspan 28.5–33 mm (male) and 29.5–34 mm (female). Last segment of palpus long, acute. Antenna white and brown; strongly bipectinate (male); fine, filiform (female). Abdomen light grey or light brown, lacking coremata. Head and thorax brownish grey, with black tipped hairs, mostly on thorax. Ground colour of forewing brownish grey, more or less irrorated with brown, ochreous and whitish scales, markings more or less contrasting, rarely concolorous. Marginal field and some patches regular darker, except for almost unicolorous specimens. Orbicular and reniform spots regular, usually light grey or light brown, lighter than ground colour. Claviform spot regular, usually bordered and also more or less filled with brown scales. All spots encircled by fine black scales. Reniform spot convex marginally. Ante- and postmedian lines expressed; antemedian line wave-shaped, double, by brown scales formed, field between them lighter than ground colour. Postmedian line arched, more or less dentate. Subterminal line usually light, fine, wave-shaped; with W-shaped wave in the middle; on dark specimens obsolescent; usually with 6–8 dark brown arrowheads internally. Cilia ochreous, with broad, interrupted brown stripe. Hindwing almost unicolorous light brown, marginal field with slightly darker stripe, cilia white or ochreous. Underside of forewing light brown, rarely whitish; hindwing lighter. Wings with fine brown scales irrorated, especially near to apex. Shadows of reniform spot, postmedian and subterminal lines (on forewing), and of cellular lunule and median stripe (on hindwing) more or less visible. On dark specimens marginal field with stripe-shaped shadow.

Male genitalia (Figs 6–8, 27–29): Generally of the type of *C. turpis*-group. Uncus long and straight, “neck” of the cucullus relatively narrow with large “head”; ventral processus of sacculus short, not acute but obtuse, distal part of vesica relatively broad, with wide and short field of long, needle-like fasciculate cornuti. (Male genitalia of *C. turpis*: see Figs 9–10, 30).

Female genitalia (Figs 42–44): Generally of the type of the *C. turpis*-group; papillae anales very weakly sclerotized, rounded, covered by thin setae; posterior apophyses very thin, straight, ostium bursae only weakly or moderately sclerotized laterally, ductus bursae relatively short, nearly straight, only slightly arched medially, weakly ribbed terminally; corpus bursae globular with two large signa; appendix bursae shorter than in the former species, ribbed and weakly rugulose longitudinally. (Female genitalia of *C. turpis*: see Fig. 45).

Taxonomic relationships: Populations are very diversified; very contrasting and almost concolorous specimens have been collected in each population. Variations in male genitalia are also considerable but no constant differences have been found. Consequently, we do not have any evidence to subdivide this material into more than a single species. We consider that *C. psychrogena* is probably the sister species of *C. turpis*; from *C. peregovitsi* and *C. aksakal* more differentiated.

Bionomics and distribution: The new species occurs in isolated populations on the high, extremely continental, semidesert-like plateau of the eastern Pamir,

between 3900–4300 m altitudes where locally it seems to be not rare. In this elevation, about middle of July, the commonest species was *C. zetina* STAUDINGER and only a few other noctuid species of the genus *Euxoa*, *Hadula*, *Discestra* and *Cucullia* were collected; some of them undescribed yet. *C. turpis* also sympatrically occurs in the high Pamirs but it seems to be scarce.

Etymology: the name of the new species refers to its cold-continental high mountain habitat.

Ctenoceratoda aksakal sp. n.

(Figs 11, 41, 57, 85)

Holotype, male: Tadjikistan, E Pamir, Sarykolsky Mts, Dunkeldyk lake, 4100 m, 25–27.07. 1996, leg. LUKHTANOV, coll. P. GYULAI, deposited in HHNM.

Slide: male, No. 806 GYULAI.

Diagnosis: The new species belongs to the *C. turpis* species-group by the male genitalia. It is related to *C. turpis*, *C. psychrogena* and *C. peregovitsi* and also somewhat similar to *C. anthracina* sp. n. but it can easily be separated from these species by external features, without checking the genitalia. The very long antennae, the relatively short but thick setae of the antennae, the almost concolorous silvery forewings, the simple transversal lines, the almost straight subterminal line, the swollen last segment of palpi and the presence of coremata typify this new species. In the male genitalia, the “neck” of the cucullus is slender, the “head” relatively small and rounded. Aedeagus relatively long, curved; vesica elongate with very narrow stripe of fasciculate cornuti.

Description: Forewing length 17 mm, wingspan 32.5 mm. Antenna very long, relatively slender, but with thick setae; dark grey, on the underside black. Last segment of palpi knobby. Hairs of head and thorax silvery, mixed with black and whitish tipped hairs. Abdomen whitish buff, with coremata. Forewing almost unicolorous silvery whitish-grey, irrorated with fine black scales. Maculation obsolescent, concolorous with ground colour. Orbicular spot normal, reniform spot large, almost quadrangular, claviform spot little; all spots very finely bordered by black scales. Transversal lines simple, moderately dentate, postmedian line arched; both lines fine dark brown, doubled. Subterminal line obscure, almost straight, with very fine ochreous filling, by dark brown scales bordered, with six dark brown arrowheads internally. Cilia whitish with brown stripe. Hindwing light grey, but more and more darker externally. Cilia white. Underside of wings whitish, irrorated with brown scales. Shadows of postmedian line and median lines represented by broad brown stripes. Marginal field slightly darker. Cilia whitish with brown irroration.

Female unknown.

Male genitalia (Figs 11, 41): Uncus relatively short and broad, valva elongate; ampulla long, curved; ventral process of sacculus elongate, “neck” of cucullus long, slender; head of cucullus small, rounded. Aedeagus long, arched, relatively slender with strong, triangular carina. Vesica rather long with very narrow stripe of fasciculate cornuti.

Taxonomic relationships: This new species seems to be mostly related to *C. turpis* and *C. psychrogena* but essentially differs by the presence of abdominal

coremata, by the striking external dissimilarity and also by the conspicuous characters of the male genitalia, which justify the description of this new species. We provisionally include it into this species-group, as a relatively remote member of it.

Bionomics and distribution: The single known specimen was found in the Sarykol Mts (E Pamir) in high elevation (4100 m). It must be very local and rare. It flies sympatrically with *C. psychrogena* sp. n. but it is possible that the flight periods of the two taxa do not overlap exactly.

Etymology: "Ak" means "white" in several Turkish languages (changed in Hungarian to "agg" = "old"); old, white-bearded "*Pater familias*" is called "Aksakal".

Ctenoceratoda tancrei species-group

This species group includes the following species: *C. tancrei* (GRAESER, 1892), *C. thermolimna* (BOURSIN, 1964), *C. anthracina* sp. n., *C. naryna* sp. n., *C. transalaica* sp. n.

Diagnosis: Large, robust and long-winged species with very long, strongly bipectinate antennae. The colouration is simple, lines and maculation are often obsolescent, reniform macule regular, but often with whitish radial stripe basally. In the male genitalia: uncus relatively thin and long; ampulla relatively long, often acute; cucullus with convex distal margin with an incision externally. All species are confined to the arid mountains of the Tien-Shan mountain system, but they occur mostly in moderately high elevations, in semidesert-like habitats.

Ctenoceratoda anthracina sp. n.

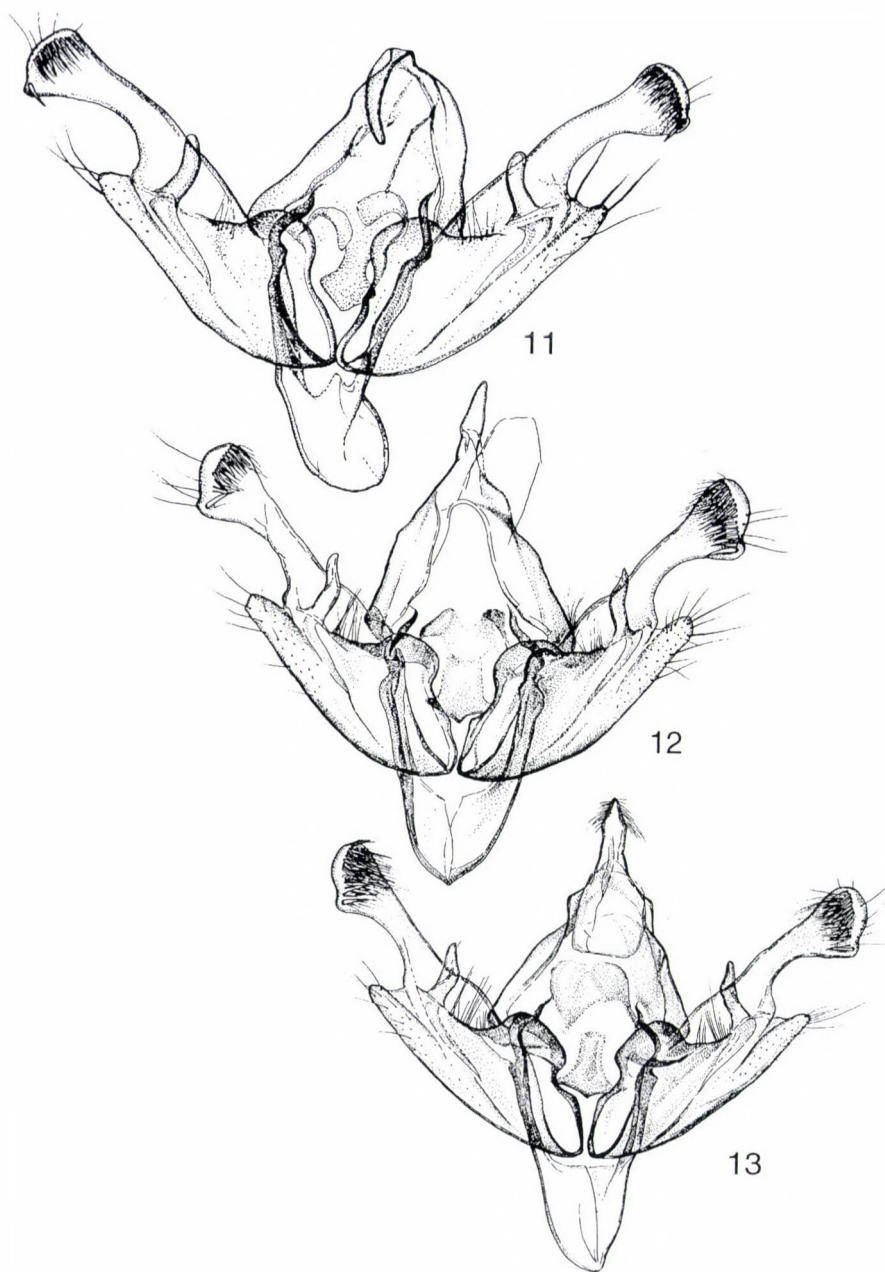
(Figs 12–13, 31, 46, 63, 86)

Holotype, male: Kyrgyzstan, Naryn region, Maly Naryn, Orukhtau, 2700 m, 23.06.1996, leg. LUKHTANOV, coll. P. GYULAI, deposited in HNHM.

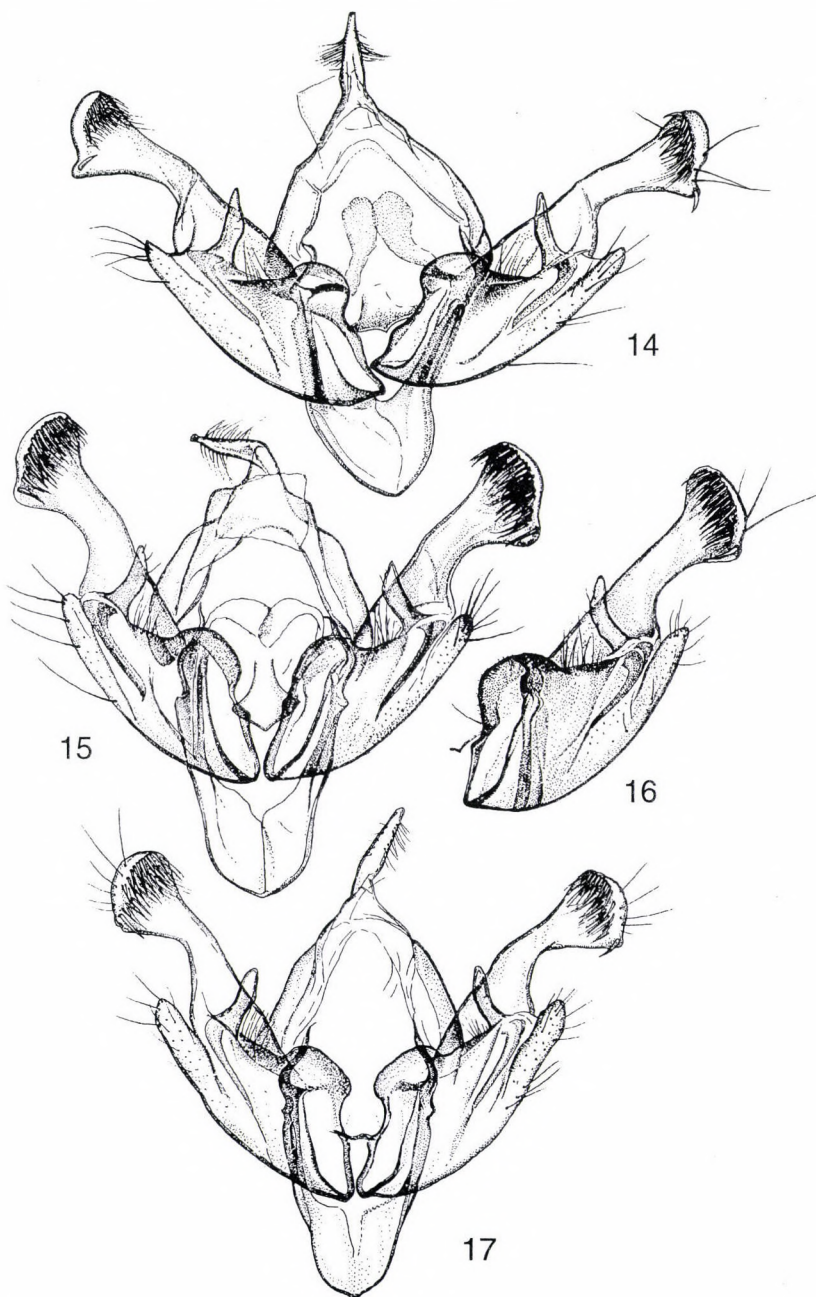
Paratypes: one male with the same data, coll. G. RONKAY; one female, with the same data, coll. P. GYULAI; one male, Kyrgyzstan, Terskey Alatau range, W of Kotshorka, 1800–2200 m, 13–14.06.1995, leg. LUKHTANOV, coll. P. GYULAI.

Slides: males, No 832, 833 (GYULAI); female, No 6114 (RONKAY).

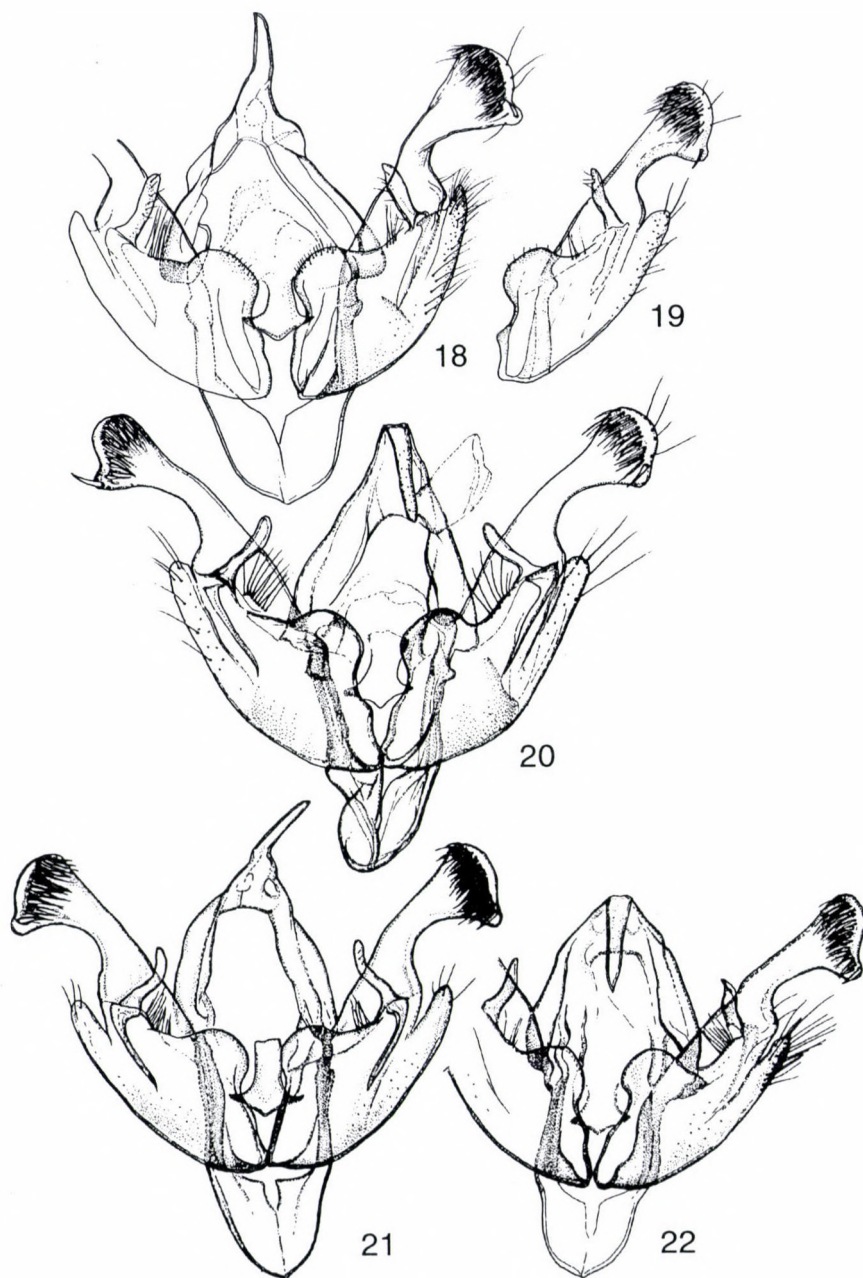
Diagnosis: A relatively large, almost unicolorous dark grey species. As regards the male genitalia, it is mostly related to *C. thermolimna*. In external features it is also somewhat similar to *C. turpis*, but it differs by the density of the setae of the male antenna, by the grey (never brownish) colouration, by the very broad, more triangle-shaped forewing, by the quadrangular reniform spot and by the very early (June) flight-period; from *C. peregovitsi*, beside the differences mentioned above, also by the longer bipectinate (with essentially longer setae)



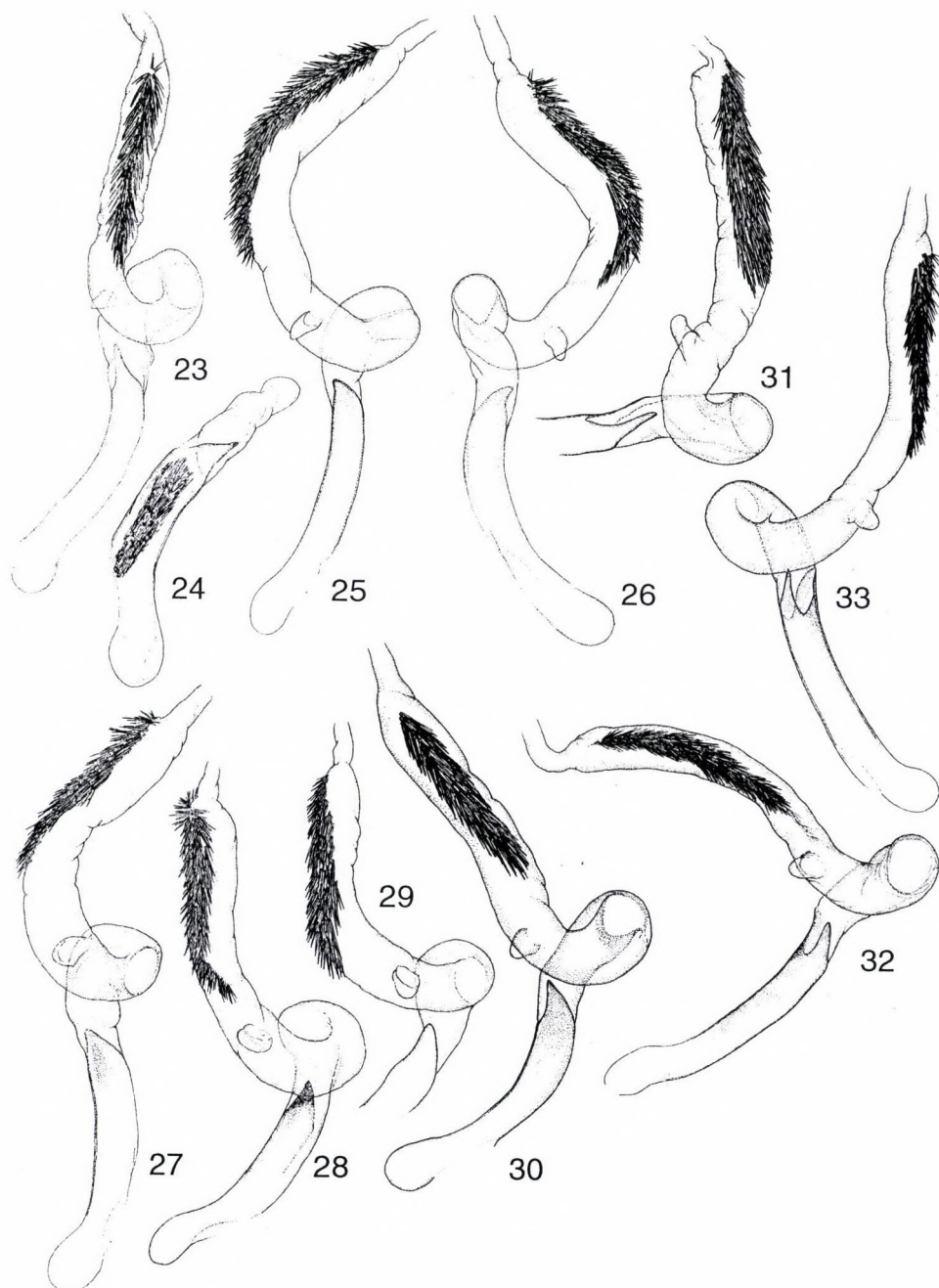
Figs 11–13. Male genitalia of *Ctenoceratoda* species: 11 = *C. aksakal* sp. n., Pamir, Dunkeldyk lake, slide 806 (GYULAI), holotype; 12 = *C. anthracina* sp. n., Kyrgyzstan, Naryn reg., slide 832 (GYULAI), holotype, 13 = *C. anthracina*, Kyrgyzstan, Naryn reg., slide 833 (GYULAI), paratype



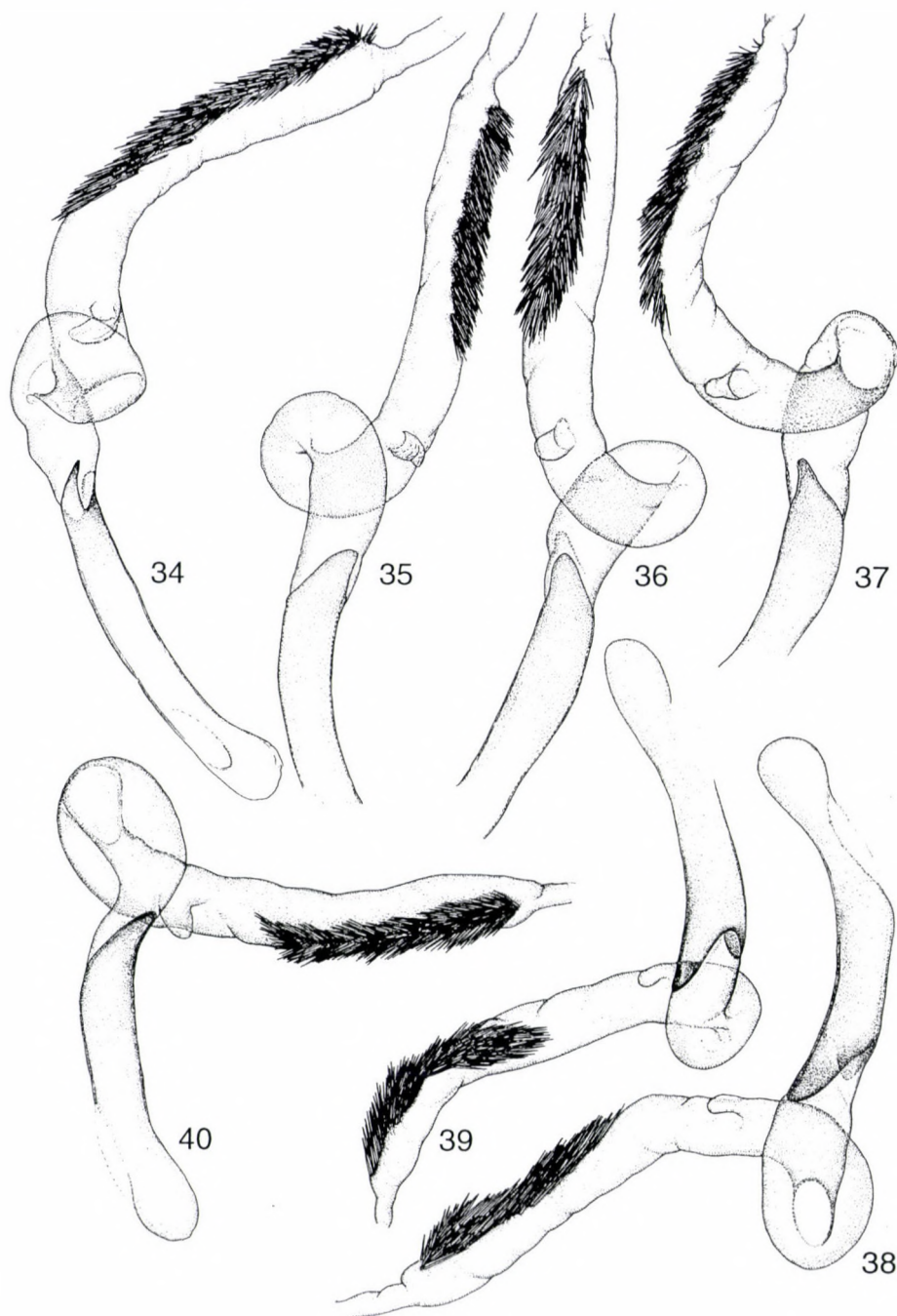
Figs 14–17. Male genitalia of *Ctenoceratoda* species: 14 = *C. thermolimna* BOURSIN, Issyk-Kul, slide N 556 (BOURSIN, ZSM); 15–16 = *C. naryna* sp. n., Kyrgyzstan, Naryn region, 15 = holotype, slide 830, 16 = paratype, slide 831 (GYULAI); 17 = *C. transalaica* sp. n., Kyrgyzstan, Transal'ai, Aram Kungei, slide 824 (GYULAI), holotype



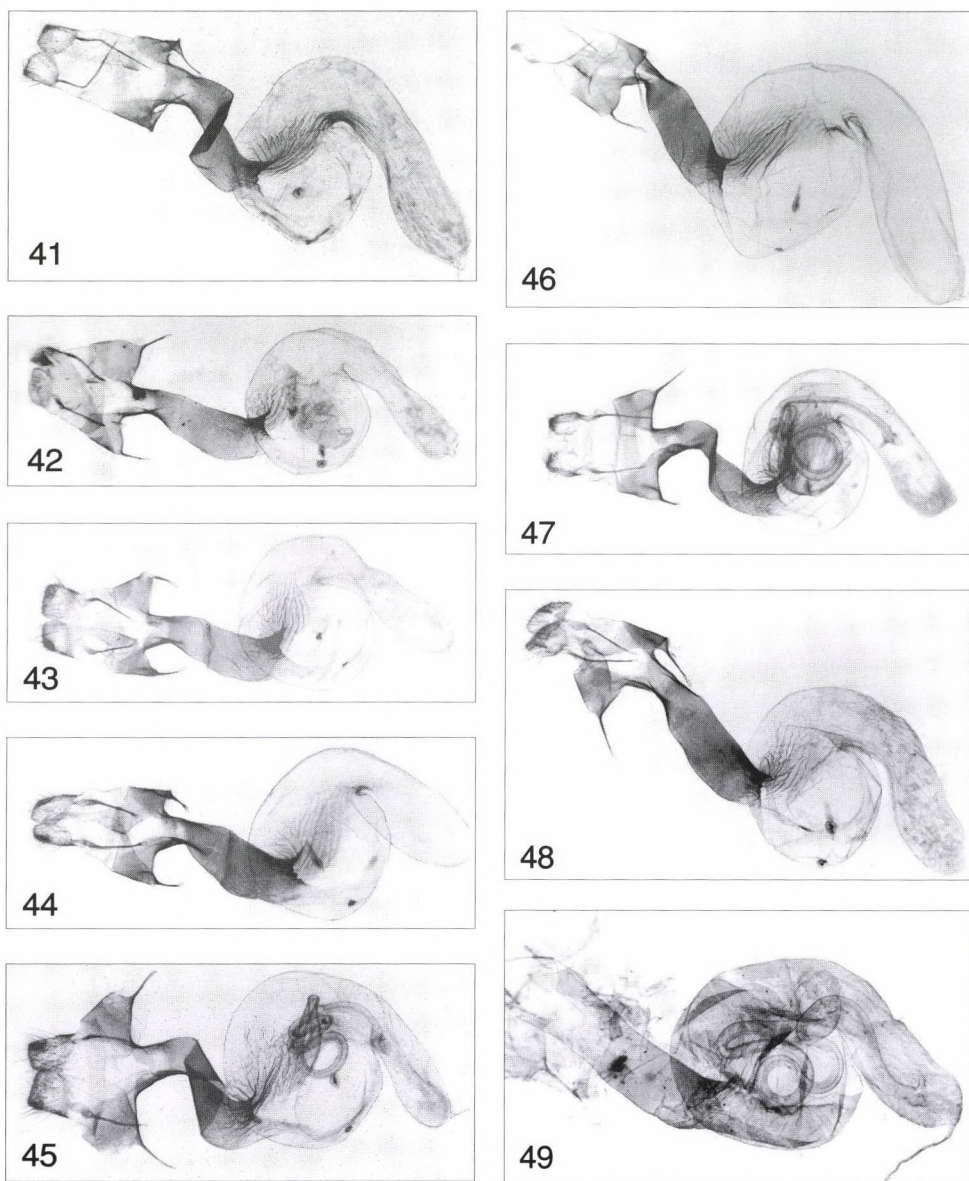
Figs 18–22. Male genitalia of *Ctenoceratoda* species: 18 = *C. tancrei* GRAESER, “Alexander-Gebirge”, slide 4067 (VARGA), 19 = “Tien-Shan”, slide 4843 (VARGA); 20–22 = *C. graeseri* PÜNGELER, 20 = Kazakhstan, Bakanas, slide 735 (GYULAI), 21 = Dzarkent, Chamil Hami, slide 4844 (VARGA), 22 = holotype, slide MB 524 (BOURSIN)



Figs 23–33. Aedeagi of *Ctenoceratoda* species with everted vesica (slides as in Figs 1–23, unless otherwise stated): 23 = *C. lukhtanovi* sp. n., 24 = *C. longicornis* GRAESER, 25–26 = *C. peregovitsi* sp. n., 27–29 = *C. psychrogena* sp. n., 30 = *C. turpis* STAUDINGER, 31 = *C. anthracina* sp. n., 32 = *C. thermolimna* BOURSIN, slide 3797 (VARGA), 33 = *C. naryna* sp. n.



Figs 34–40. Aedeagi of *Ctenoceratoda* species with everted vesica (slides as in Figs 1–23, unless otherwise stated): 34 = *C. transalaica* sp. n., 35–37 = *C. tancrei* GRAESER, 38–39 = *C. graeseri* PÜNGELER, 40 = *C. aksakal* sp. n.



Figs 41–49. Female genitalia of *Ctenoceratoda* species; 41 = *C. lukhtanovi* sp. n., slide 6113 (RONKAY), paratype; 42–44 = *C. psychrogena* sp. n., slides 6110, 6111, 6112 (RONKAY), paratypes; 45 = *C. turpis* STAUDINGER, slide 6108 (RONKAY); 46 = *C. anthracina* sp. n., slide 6114 (RONKAY); 47 = *C. naryna* sp. n., slide 6109 (RONKAY); 48 = *C. transsalaica* sp. n., slide 6115 (RONKAY); 49 = *C. graeseri* PÜNGELER., slide 7023 (VARGA)

male antenna; from *C. psychrogena* – beside the the differences mentioned above – by the short, obtuse last segment of the palpus, by the male abdominal coremata, by the obsolescent markings, by the more uniform colouration (never whitish coloured forewings). *C. anthracina* sp. n. is about the same size as *C. thermolimna* and larger than the species of the *C. turpis* species-group. From *C. aksakal* it differs also by the much broader forewings, by the colouration of the forewings (grey but never silvery), by the broader bipectinate (with weaker setae) male antenna and by the early flight period. In the male genitalia: *C. anthracina* has relatively large genital capsula with strong uncus, ventral processus of sacculus broader, incision at the margin of cucullus less marked and juxta higher than in *C. thermolimna*. The new species strongly differs from all known species of the "*C. turpis*" species-group by the essentially larger genitalia, larger cucullus with swollen margin.

Description: Forewing length 16–18 mm (males) and 18 mm (female), wingspan 32–33 mm (males) and 35 mm (female).

Male: Head, thorax and abdomen grey; some hairs tipped with black and white. Antenna grey, strongly bipectinate. Last segment of the palpus short and obtuse. Abdomen with coremata. Ground colour of the forewing grey, very unicolorous, all markings obsolescent. Maculation of the same colour as ground colour; orbicular spot slightly elongate, reniform spot almost quadrangular, weakly convex marginally, with 2–3 white points internally. Maculation (especially the claviform) more or less bordered by fine black scales. Transversal lines very obscure, antemedian line wave-shaped, doubled; two very fine, dark brown, interrupted lines with lighter field between them. Postmedian line also double, arched, weakly crenulate externally. Subterminal line very fine, interrupted, ochreous line with dark brown arrowheads internally. Cilia ochreous, with two broad, dark stripes. Hindwing brown, cellular lunule and median obscure but visible, also broad darker stripe externally; all these markings darker than ground colour. Cilia ochreous with dark stripe. Underside of wings brownish grey, irrorated with dark brown scales, especially on the costa of the forewing and on the hindwing. The shadow of the reniform and of the postmedian line (on the forewing) and of the median and of the cellular lunule (on the hindwing) dark brown, more or less visible. Cilia ochreous, then widely brown on the forewing, but almost ochreous on the hindwing.

Sexes similar, female antenna very fine, filiform, whitish with black rings.

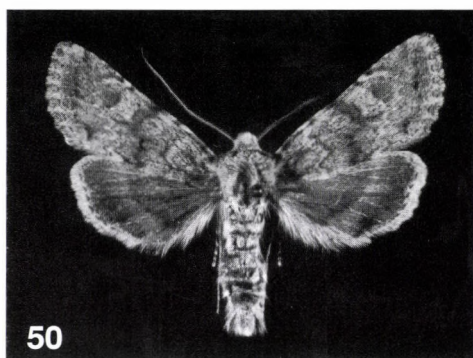
Male genitalia (Figs 12–13, 31): Uncus strong, relatively broad medially, tipped acutely; tegumen very broad, triangular; valva large, dorsal costa of sacculus convex, swollen; ventral processus of sacculus relatively strong, acute; ampulla strong, acute, slightly curved; neck of cucullus fairly long, slightly arched; costa of cucullus convex, swollen, with only very slight incision; aedeagus strong, long, slightly curved; vesica with long field of fasciculate cornuti.

Female genitalia (Fig. 46): Papillae anales rounded, with very fine setae; apophyses posteriores thin, straight; apophyses anteriores short, basally curved; ostium bursae narrow, very strongly sclerotized laterally, ductus bursae broader medially, strongly ribbed terminally, corpus bursae huge with two large signa, appendix bursae very elongate, only weakly ribbed longitudinally.

Taxonomic relationships: It seems to be most closely related to *C. thermolimna* (Fig. 64), which is, however, larger, more clearly marked and distinct from it by the male genitalia (Figs 14, 32). The presence of abdominal coremata, the form of cucullus and the elongate vesica with a long stripe of fasciculate cornuti indicate that both species should belong to this species group. The female of *C. thermolimna* is, unfortunately, unknown.

Bionomics and distribution – The new species is known only from Kyrgyzstan, where it is a local and rare species, flying in the mountains in medium high elevations (1800–2700 m). Flight period seems to be very early, depending on the altitude; female also appears in the middle of June.

Etymology: The name reflects to the colouration.



Figs 50–55. 50–52 = *Ctenoceratoda lukhtanovi* sp. n., Pamir: Muzkol Mts, holotype male, paratypes male and female; 53 = *C. sp. cf. longicornis*, Kyrgyzstan, Alai Mts, male; 54 = *C. longicornis* GRAESER, Kysil-Yart, holotype, male; 55 = *C. peregovitsi* sp. n., Mongolia, Möncharjrehan, paratype, male

Ctenoceratoda naryna sp. n.
(Figs 15–16, 33, 47, 66–67, 87)

Holotype, male: Kyrgyzstan, Naryn region, Maly Naryn, Uzungyr, 2700 m, 24.06.1996, leg. LUKHTANOV, coll. P. GYULAI, deposited in HNHM.

Paratypes: one female with the same data, coll. P. GYULAI; one male, Kyrgyzstan, Naryn region, Dshetin Mts, 70 km NEE of Naryn, 2500–3000 m, 17–21.08.1995, leg. LUKHTANOV, coll. G.



Figs 56–61. 56 = *Ctenoceratoda turpis* STAUDINGER, Pakistan, male; 57 = *C. aksakal* sp. n., Pamir: Dunkeldyk lake, holotype, male; 58–61 = *C. psychrogena* sp. n., Pamir: Wakhan Mts, Pshart Mts, Ak-Bura Mts, holotype male, paratype female and male paratypes

RONKAY; one female, Kyrgyzstan, Naryn region, Maly Naryn river, Oruktam, 2700 m, 23.06.1996, leg. LUKHTANOV, coll. P. GYULAI.

Slides: males, Nos 830 (holotype) and 831 (GYULAI); female, No 6109 (RONKAY).

Diagnosis: The new species is unique in its hazel brown – reddish brown colouration; only *C. transalaica* sp. n. is similar, but this species is more marked and has a more reddish colouration. A pinkish shade of the colour seems to be typical also for *C. lukhtanovi*, but *C. lukhtanovi* essentially differs in the much more elongated forewings, the quadrangular reniform spot, lacking arrowheads at subterminal line, the shortly bipectinate male antenna and by the features of the male genitalia. In external features, *C. naryna* sp. n. (and *C. transalaica* sp. n.) are more similar to *C. thermolimna* and to the members of the *C. contempta*–*C. lupa* species-group, but the new species clearly differs from the last ones by its dark brown antennae (never grey!), by the hazel- or reddish brown colouration of the forewing and by the male genitalia (especially by the long and thin uncus and by the short “neck” of the cucullus). Based on the structure of the male genitalia, the closest relative of the new species should be *C. thermolimna*, but *C. naryna* sp. n. is externally very distinct from it by its hazel brown – reddish brown colouration, by the markings of the forewing (e.g. the more arched postmedian line, the very pale, unicolorous reniform spot with a tiny whitish spot externally, the very small claviform). In the male genitalia, the cucullus is essentially broader, less convex, more trigonical, without very expressed incision, ampulla thicker and stronger, field of cornuti in the vesica broader.

Description: Length of forewing 17.5–18.0 mm (males) and 17.0 mm (females), wingspan 34.5–35.0 mm (males) and 34.0 mm (females).

Male: Head and thorax brown; some hairs black and white tipped or of pale brown colouration. Abdomen brown, with coremata. Antenna long, brown, strongly bipectinate, with long setae. Ground colour of forewing hazel brown with reddish brown suffusion, with dark brown patches on the costa. Orbicular and reniform spots regular, paler than ground colour; reniform macule quadrangular but convex marginally; very pale, concolorous, with very small, whitish point externally. Both macules more or less bordered with dark brown scales. Claviform spot regular but very small, bordered and partially filled with brown scales. Antemedian line doubled, wave-shaped, expressed, dark brown. Postmedian line weakly arched and crenulate, brown with an obscure light brown shadow. Median shadow brown-reddish. Subterminal line ochreous, fine, crenulate, with 5–7 well-marked dark brown arrowheads internally. Cilia ochreous with two broad brown stripes. Hindwing almost unicolorous brown with slightly darker stripe marginally. Cilia ochreous. Underside of forewing brown, lighter marginally, postmedian stripe obsolescent, subterminal line well visible. Hindwing whitish with intensive brown suffusion. Shadow of the median line visible and also a broad brown stripe marginally. Shadow of the cellular lunule obsolescent.

Female: antenna fine, filiform, marking and colouration similar to male.

Male genitalia (Figs 15–16, 33): Uncus moderately long, narrow, with teat-like tip; tegumen broad, triangular; valva large, dorsal margin of sacculus convex, finely granulose and covered with short setae; ventral processus of sacculus short, rounded; harpe broad and long, curved; neck of cucullus broad, straight; ampulla very strong, the dorsal costa of valvae overranging; juxta higher than broad; aedeagus thick, strong, curved; vesica very long, recurved, with long fascia of cornuti.

Female genitalia (Fig. 47): Papillae anales weakly sclerotized, rounded, covered by thin setae; apophyses posteriores thin, straight, apophyses anteriores short, straight; ostium bursae trape-

zoidal, strongly sclerotized laterally; ductus bursae S-shaped, curved twice; ribbed and rugulose terminally; corpus bursae globular, with two more and two less sclerotized signa; appendix bursae elongate, weakly saccate, longitudinally ribbed and rugulose terminally.

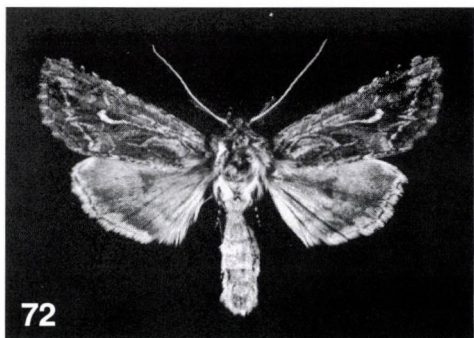
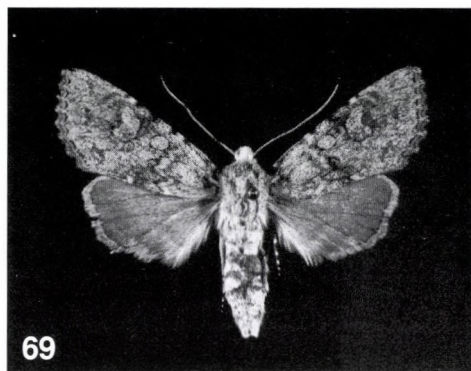
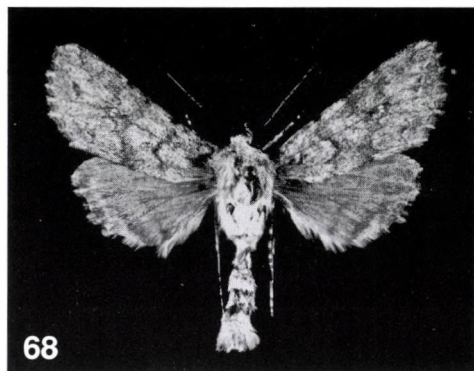
Taxonomic relationships: It seems to be most closely related to the next species, but the differences in the genitalia of both sexes and also the external characters (wing shape, more distinct patterns) indicate that it must be a separate



Figs 62–67. 62. *Ctenoceratoda psychrogena* sp. n., Pamir: Wakhan Mts, Pshart Mts, Ak-Bura Mts, male paratype; 63 = *C. anthracina* sp. n., Kyrgyzstan, Naryn region, holotype male; 64 = *C. thermolimna* BOURSIN, Aksu; 65 = *C. nefasta* PÜNGELER, Lop-Nor, holotype; 66–67 = *C. naryna* sp. n., Kyrgyzstan, Naryn region, holotype male and paratype female

species. All external and genital characters confirm that it belongs to this species group.

Bionomics and distribution – The new species is known only from the Naryn region in Kyrgyzstan. It occurs in 2500–3000 m altitudes. It must be a local and rare species, in view of the fact that about 70,000 noctuids have been collected in this region in the last five years.



Figs 68–73. 68–69 = *Ctenoceratoda transalaica* sp. n., Kyrgyzstan, Transalai Mts, holotype male and paratype female; 70–71 = *C. tancrei* GRAESER, Kazakhstan, Alasay-pass and Chamil Hami; 72 = *C. khorgossi* ALPHERAKY, Kazakhstan, Ustj-Kamenogorsk; 73 = *C. argyrea* VARGA, Mongolia, Tögrök, holotype

Etymology: The name refers to the fact that all the known specimens were collected in the Naryn region.

***Ctenoceratoda transalaica* sp. n.**

(Figs 17, 34, 48, 68–69, 88)

Holotype, male: Kyrgyzstan, Transalai, Aram Kungei, 2800 m, 12–15.07.1993, leg. LUKHTANOV, coll. P. GYULAI, deposited in HHNM.

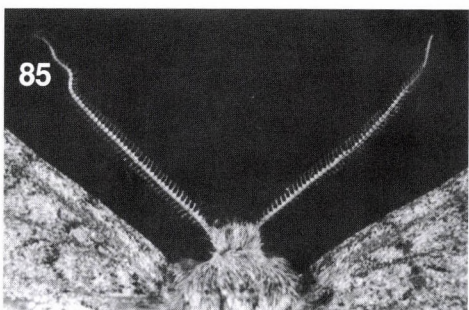
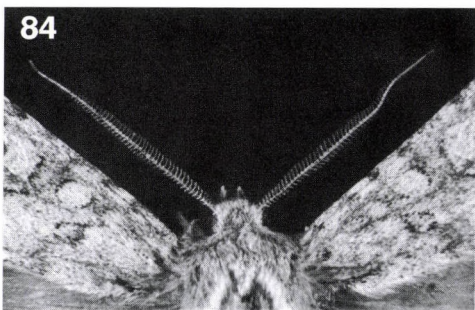
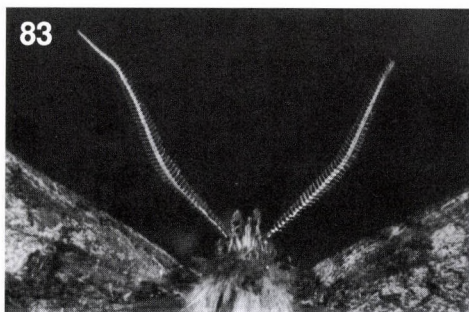
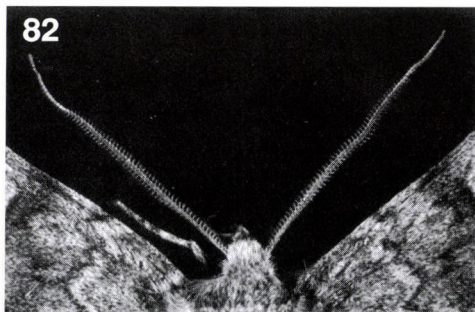


Figs 74–79. 74 = *Ctenoceratoda graeseri* PÜNGELER, holotype, male; 75–77 = *C. graeseri* PÜNGELER, Kazakhstan, Bakanas and Masak, males and female; 78–79 = *C. sukharevae* VARGA, Mongolia, Adz Bogd Mts, male and female

Paratypes: one male, Kyrgyzstan, Transalai, Aram Kungei, 3000–3200 m, 20–21.07.1995, leg. LUKHTANOV, coll. G. RONKAY; one female, Kyrgyzstan, W Transalai, Schibe, 2600 m, 17–19.07.1995, leg. LUKHTANOV, coll. P. GYULAI.

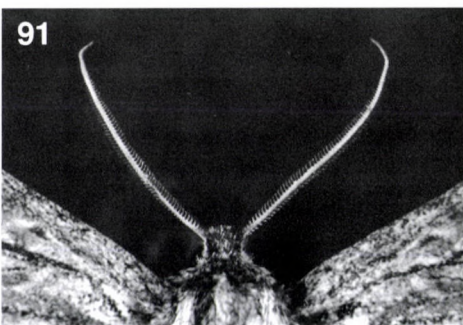
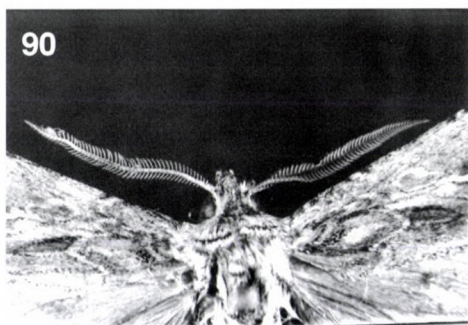
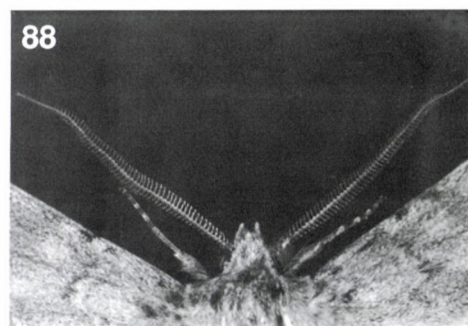
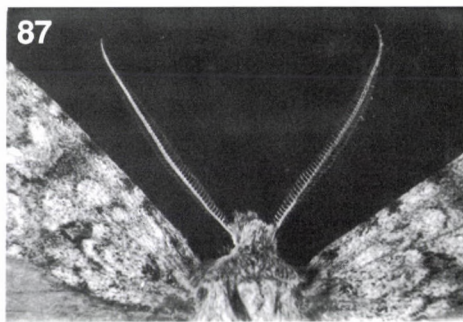
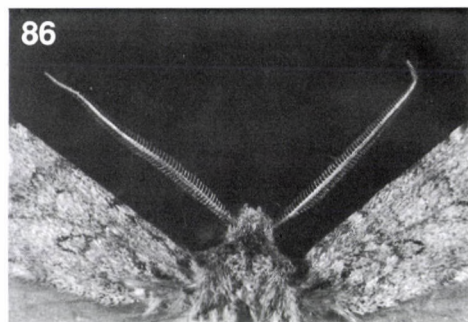
Slides: male, No. 824 (GYULAI); holotype, female, No. 6115 (RONKAY).

Diagnosis: Only *Ctenoceratoda naryna* sp. n. is a similar species. *C. transalaica* is essentially distinct from all the known taxa of the genus *Ctenoceratoda*, by the intensive reddish-pinkish colouration. Specimens larger, forewing more



Figs 80–85. 80 = *Ctenoceratoda oxyptera* VARGA, Mongolia, Tögrök, holotype male; 81 = *C. juliannae* VARGA, Mongolia, Bulgan Sum, male; 82–85 = *C. spp.*, male antennae: 82 = *C. lukhtanovi* sp. n., holotype, 83 = *C. peregovitsi* sp. n., holotype, 84 = *C. psychrogena* sp. n., holotype, 85 = *C. aksakal* sp. n., holotype

elongate and much more reddish with more obsolescent markings than in *C. naryna*. Male with abdominal coremata. Valva more elongate with strong, relatively long and curved, sickle-shaped ampulla; "neck" of cucullus longer and slender, "head" slightly smaller and more rounded than in the precedent species. The weakly sclerotized juxta and the thick transtilla seem to be important distinctive features, compared to all other species of this species group.



Figs 86–91. *Ctenoceratoda* spp., male antennae: 86 = *C. anthracina* sp. n., holotype, 87 = *C. naryna* sp. n., holotype, 88 = *C. transalaica* sp. n., holotype, 89 = *C. khorgossi* ALPHERAKY, 90 = *C. argyrea* VARGA, paratype, 91 = *C. graeseri* PÜNGELER

Description: Length of forewing 19.5–20 mm (males) and 19.5 mm (female), wingspan 37–39 mm (males) and 36 mm (female).

Male: Head and thorax pale reddish-pinkish brown. Antenna strongly bipectinate, with long setae. Abdomen very long; more dusty and paler brown, with coremata. Forewing longer and less marked than in *C. naryna*. Ground colour reddish with pink irroration and maculation at same colour, but paler. Maculation paler than ground colour, rather obsolescent. Ante- and postmedial lines double, dark reddish-brown, obsolescent, with dark reddish suffusion. Arrowheads obsolescent. Cilia pinkish, especially on the underside of wings. Underside of wings nearly unicolorous, light pinkish brown, irrorated with brown scales. Shadow of maculation obsolescent.

Female: antenna fine, filiform, marking and colouration similar to male.

Male genitalia (Figs 17, 34): Uncus relatively long; tegumen broad, triangular; valva large, elongate, dorsal costa of sacculus convex, strongly swollen, nearly quadrangular; ventral processus of sacculus longer than in *C. naryna*; ampulla long, slightly curved, not so extremely strong than in preceding species; neck of cucullus more slender than in *C. naryna*, slightly curved; cucullus slightly smaller, outer margin more convex than those of *C. naryna*; juxta weakly sclerotized, transtilla very broad; aedeagus like in *C. naryna*.

Female genitalia (Fig. 48): Papillae anales rounded, densely covered by fine setae; apophyses posteriores thin, nearly straight; apophyses anteriores elongate, thin, straight; ostium bursae strongly sclerotized laterally; ductus bursae nearly straight, broader medially, weakly rugulose and ribbed terminally; corpus bursae huge, globular with two large, strongly sclerotized signa; appendix bursae very long, strongly ribbed longitudinally.

Taxonomic relationships: This new species is closely related to the preceding species, but clearly distinct from it both in the external and genital characters. Especially the very peculiar characters of the juxta and transtilla indicate that it cannot be regarded only as a subspecies of the former one. See figures 70–71 for 2 specimens of the well-known representative of this species-group, *C. tancrei*, and male genitalia are depicted in figures 18–19 and 35–37).

Bionomics and distribution: The new species is confined to high ranges (2600–3200 m) of the Transalai Mts, in Kyrgyzstan, where it seems to be very local and rare.

Etymology: This species known only from the Transalai range.

Ctenoceratoda khorgossi species-group

This group consists of the following species: *Ctenoceratoda khorgossi* (ALPHERAKY, 1882), *C. argyrea* VARGA, 1992, *C. graeseri* (PÜNGELER, 1898) **bona sp.**

Diagnosis: Species of moderate size, forewing not very elongate with shiny, often silvery colouration and very characteristic pattern: an arrowhead- or pipe-shaped acute extension is attached to the reniform macule basally, male antenna long, strongly bipectinate (see Figs 89–90). They have a peculiar geographical distribution and remarkable phenological subdivision: *C. khorgossi* (Fig. 72): very large area, covering the distribution of the other species; flying in spring and early summer, *C. argyrea* (Fig. 73): sympatric with *C. khorgossi*, but never with

C. graeseri flying in mid-summer, *C. graeseri* (Fig. 74): sympatric with *C. khor-gossi* flying in late-summer.

* * *

Acknowledgements – Authors are indebted to the late Dr W. DIERL, Dr M. HREBLAY, Dr W. MEY, Mr G. RONKAY & Dr L. RONKAY for lending important comparative materials including type specimens. We express our sincere thanks to Dr L. RONKAY for the female genitalia slides of several new species and useful suggestions in many difficult taxonomic questions. Two referees have improved the text considerably. The authors appreciate also the valuable technical assistance of Mr P. KOZMA. The surveys were supported by OTKA grant No T16465.

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The oribatid species described by Berlese (Acari)

MAHUNKA, S. and L. MAHUNKA-PAPP

The authors had the opportunity for years to study the Oribatid species described by Berlese currently deposited in the Istituto Sperimentale per la Zoologia Agraria at Florence. The results of this series of studies are summarized in this volume.

The volume begins with an essay-like Introduction heavily relying on subjective opinions discussing the general questions of Oribatology. The following section lists Berlese's species placed in the modern system helping the specialists with morphological notes and many drawings; here also the condition of the specimens is discussed and lectotypes are designated.

The third, large section is the catalogue proper, wherein all the species are listed in the systematic order together with their combination and synonymic names. Here one may find all the literature data, usually missing from ordinary works, with reference to Description and Taxonomy, Distribution, with special emphasis on Catalogues whose references are partly unreliable. Where it was deemed necessary further information are added under the heading of Remarks. The volume closes with a very detailed list of literature.

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Key words should not be more than five (exceptionally 6) key word entries.

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Results should be presented concisely. Only in exceptional cases will it be permissible to present the same set of results in both table and a figure. The results section should not be used for discussion.

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NORRBOM, A. L. and KIM, K. C. (1985) Taxonomy and phylogenetic relationships of *Copro-myza* Fallén (s.s.) (Diptera: Sphaeroceridae). *Ann. Entomol. Soc. Am.* **78**: 331–347.

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HINTON, H. E. (1981) *Biology of insect eggs*, vol. 2. Pergamon Press, New York, 234 pp.
or

MCALPINE, J. F. (1981) Morphology and terminology, adults. Pp. 9–63. In MCALPINE *et al.* (eds) *Manual of Nearctic Diptera*, vol. 1. Agriculture Canada, Ottawa.

In the text references should be given as MARSHALL (1992) or (MARSHALL 1992). When a citation includes more than two authors, e.g. GREY, BLACK and WHITE, the paper should be referred to in the text as GREY *et al.*, provided that this not ambiguous. If papers by the same author(s) in the same year are cited, they should be distinguished by the letters, *a*, *b*, *c*, etc., e.g. MARSHALL (1992a).

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A NEW SPECIES OF EXOSTIRA
BORCHMANN FROM BORNEO, WITH
COMMENTS ON THE GENUS
(COLEOPTERA, TENEBRIONIDAE: LAGRIINI)*

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Exostira borneana sp. nov. is described from the Crocker Range, Borneo. New synonymy: *Exostira unicipennis* (FAIRMAIRE, 1882) = *Casnonidea variipennis* FAIRMAIRE, 1887. With 9 figures.

Key words: taxonomy, Coleoptera, Tenebrionidae, Lagriini, *Exostira*, new species, Oriental region, Malaysia, Borneo

INTRODUCTION

Situated in the northernmost part of Borneo, the Crocker Range is home to a number of endemic lagriines, although most of them has not been described as yet. This fauna includes remarkably large forms, e.g. *Sphinctoderus strangulatus* FAIRMAIRE, 1903, an odd-looking species of its monotypic genus and *Cerogria heros* (FAIRMAIRE, 1903), which is one of the largest species of the subtribe Lagriina surpassed only by some species of *Bothrionota* BORCHMANN, 1937 from the Philippines. As for the subtribe Statirina, a few giant specimens were found in materials collected recently in the area which represent a new species of the genus *Exostira* BORCHMANN, 1925. This is the largest (24–26 mm) of all known members of Statirina, larger than *Statira ingens* CHAMPION, 1889 from South America or any described species of *Exostira* of the Oriental region.

The specimens examined are deposited in the following collections indicated in the text by their respective acronyms: HNHM – Hungarian Natural History Museum, Budapest, Hungary; IJNK – private collection of I. JENIŠ, Náklo, Czech Republic; LKOC – private collection of L. KLIMA, Ostrava, Czech Republic; NHMW – Naturhistorisches Museum, Wien, Austria; NNML – Nationaal Natuurhistorisch Museum, Leiden, The Netherlands; SBCB – private collection of S. BECVÁR, České Budejovice, Czech Republic.

* 12th contribution to the knowledge of Lagriini.

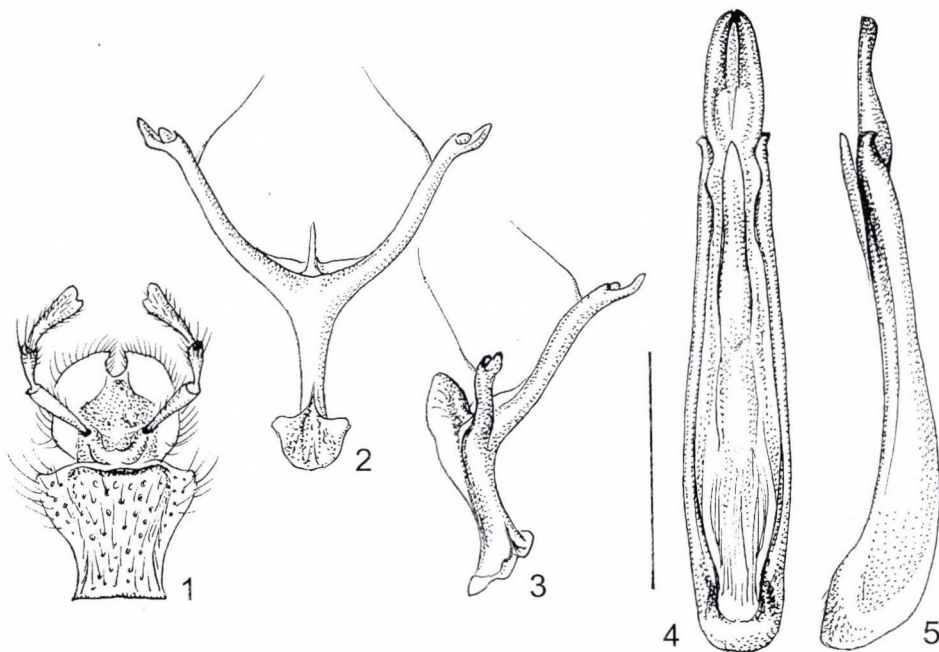
Morphological names of various body parts are largely based on DOYEN (1966).

***Exostira borneana* sp. n.**

(Figs 1–7)

Material examined. Holotype, male (HNHM), labelled as follows: "Park. H. Q N. Borneo 20. II. 1980 H. DETANT" [printed on white paper]; "Holotypus ♂ *Exostira borneana* MERKL, 1999 [printed and handwritten on red paper]. – Paratypes. Malaysia (Sabah): Mt. Kinabalu, Park Headquarters, 26.III.1986, M. ITO (1 ♀, HNHM); Kimanis Road, near Keningau, 2.III.1994, M. ITO (1 ♀, HNHM); Crocker Mts., Gunong Emas env., 15–27.IV.1993, JENIŠ & STRBA (1 ♀, IJNK); Crocker Mts, Gunung Emas, 500–1900 m, 6–21.V.1995, IVO JENIŠ (1 ♀, SBCB) (Fig. 6); Gunung Emas, 1700 m, 21.III.–20.IV.1998, J. KADLEC (1 ♂, 2 ♀♀, LKOC, 1 ♀, HNHM); Kundasang, 1500 m, 4–8. IX. 1994, C. L. LI (1 ♂, NHMW) (Fig. 7).

Description. Body elongate, about four times as long as wide, parallel-sided, distinctly convex dorsally. Dorsal colour generally dull tan; head with temples and a small spot on frontoclypeal suture black; elytra mottled with black spots situated mainly around base of setigerous punctures of costae (Fig. 6) but may be extended to intercostal areas as well (Fig. 7); elytral epipleura blackish anteriorly with tan upper margin and entirely tan beyond level of abdominal sternite 1; lateral portions of pronotal disc darker brown, leaving midlongitudinal area of variable width paler; prothoracic hypomeron and prosternum black; mesosternum and mesepimeron black, mesepisternum



Figs 1–5. *Exostira borneana* sp. n.: 1 = labium, ventral view (note the emarginate apex of apical palpomere), 2 = metendosternite, dorsal view, 3 = metendosternite, oblique left lateral view, 4 = aedeagus, ventral view, 5 = aedeagus, lateral view. Scale = 2 mm

largely reddish brown; metasternum black with two ill-defined reddish areas, metepisternum reddish brown to black; antennae dark brown with last antennomere slightly paler; abdominal sternites reddish brown with darker margins to largely black with vaguely indicated central area of red; coxae blackish; trochanters brownish; ground colour of femora pale brownish yellow with black apex and an ill-defined, large blackish medial section on ventral side which may extend to dorsal side; apical 2/3 of fore femora sometimes entirely darker; tibiae and tarsi dark blackish brown. Length 24–26 mm.

Head strongly elongate, strongly constricted behind temples; length-to-width ratio as 53:40 (length is measured from posttemporal constriction to tip of mandibles); interocular distance 0.25 × eye diameter in dorsal view; surface finely punctate; setae present mainly on labrum but also on clypeus, frons and temples; eyes large, narrowly separated, barely emarginate anteriorly; temples very short; frontoclypeal suture deep, V-shaped; genae shiny, prominent; clypeus with broad membranous strip over base of labrum. Labrum slightly wider than long, widening from base toward apex, slightly concave apically; anterolateral corners rounded. Antennae elongate, extending to level of hind coxae; antennomeres elongate and filiform, not modified in males; last antennomere nearly as long as antennomeres 8–10 combined; antennomere length ratios as 19:7:17:21:19:17:17:16:14:14:45. Mandibles prominent, fairly elongate, only slightly asymmetrical; apically unidentate but left mandible with a minute subapical denticle ventrally; lateral portion bordered by prominent ridge, widest at base and strongly tapering toward apex; lateral surface covered with yellow hairs which are longer and denser toward incisor lobes; prostheca fringed with short hairs; right mola in medial view transverse, subquadrate, with anterior and posterior margins nearly straight, occlusal surface slightly convex; left mola in medial view with anterior and posterior edges emarginate, occlusal surface slightly concave. Maxilla with lacinia slender, densely set with long hairs; galea elongate set with a number of long hairs which form a conspicuous, golden tuft; maxillary palp nearly twice longer than galea, apical palpomere elongate triangular. Mentum nearly flat, about as long as wide; less than twice as wide at widest point than at base, with concave lateral sides; prementum with ligula somewhat larger than mentum, strongly bilobed anteriorly, lobes acute at apex and densely pubescent; labial palp elongate, apical palpomere longer than penultimate, slightly emarginate apically (Fig. 1). Gula convex, gular sutures slightly arcuate, strongly divergent posteriorly. Pregular region meeting with submentum at obtuse angle.

Prothorax elongate, although its length is equal to width of base. Pronotum widest at base and constricted in front of base; pronotal disc convex, uneven; lateral pronotal carina feebly indicated; anterior edge finely margined; posterior edge slightly raised; surface glabrous, irregularly set with coarse, umbilicate punctures; interspaces between punctures 0.5–3 × puncture diameter; raised posterior edge impunctate; hypomeron sparsely punctate and also with conspicuous transverse wrinkles anteriorly; pronotosternal suture straight, vaguely indicated. Prosternum impunctate, in front of procoxae about 1.5 times longer than width of procoxal cavity; prosternal process half as wide as width of procoxal cavity; intercoxal process margined at sides, strongly declivous behind procoxae, apex broadly rounded, extending slightly beyond hind margin of prothoracic hypomeron. Mesosternum impunctate, except for a few punctures of lateral portion; mesepisternum, mesepimeron and metepisternum coarsely and sparsely punctate; metasternum impunctate mesally, with fine punctures laterally which becoming coarser toward lateral margin.

Elytra elongate, length-to-width ratio as 17:6; sides subparallel; apex acutely rounded; lateral margins visible from above only at level of abdominal sternite 3 because of overhanging humeral carina; surface irregularly punctate; disc with 3 longitudinal carinae which correspond to interstriae 3, 5 and 9; first carina blunt, petering out just before apex; second carina sharp, a little shorter than first; third (humeral) carina sharp, reaching apex; surface flat between carinae; two short, narrow additional carinae present across humeral callosity; sutural region also somewhat raised; surface largely glabrous and irregularly set with coarse, umbilicate punctures; sutural margin and longitudinal carinae impunctate, except a few setigerous punctures distributed throughout the whole length; sutural margin and carinae with setigerous punctures variable in number but less than 20 on each carina. Epipleura oblique, extending to elytral apices. Scutellum rounded posteriorly, impunctate. Mesosternum horizontal anteriorly; intercoxal process of mesosternum strongly raised and deeply impressed longitudinally, extending to middle of coxae, slightly concave at apex; mesotrochantin

exposed; mesocoxal cavities closed laterally by mesepimeron. Metasternum distinctly convex; median impressed line vague anteriorly, deep posteriorly. Metendosternite with stalk and arms fairly narrow (Fig. 2); laminae indistinct; ventral longitudinal flange extending beyond base of arms, forming a thin, rounded sheet (Fig. 3); anterior tendons inserted subapically.

Hind wings with first anal cross-vein present.

Legs fairly long and narrow; femora not clavate; hind femora surpassing hind margin of visible abdominal sternite 3; tibiae narrow, straight, feebly widening toward apex, not modified in male; tarsi about 4/5 of length of tibiae; all except apical tarsomere densely pubescent ventrally.

Abdomen with intercoxal process of visible sternite 1 elongate triangular. Abdominal sterna glabrous and largely impunctate, except a few fine punctures in lateral impressions. Last visible sternite slightly sinuate laterally, with a few setigerous punctures in posterolateral area. Abdominal tergite 8 of female deeply notched at apex.

Aedeagus with basale nearly three times longer than apicale which is broadly rounded at apex (Figs 4–5).

Ovipositor with paraprocts elongate, longer than coxites; baculi of paraprocts longitudinal; baculi of coxite lobe 1 transverse; lobe 4 free, short and narrow; gonostyli terminal, proctiger slightly longer than paraprocts. Spiculum ventrale not forked. Female genital tube not studied.

Sexual dimorphism. No marked sexual differences in proportions of the main body parts, structure of legs, elytral apex as well as shape and relative length of antennomeres. Last visible abdominal sternite slightly truncate in male, broadly rounded in female. Pubescence of inner side of hind tibiae slightly denser and longer in male, especially at the base of tibiae.

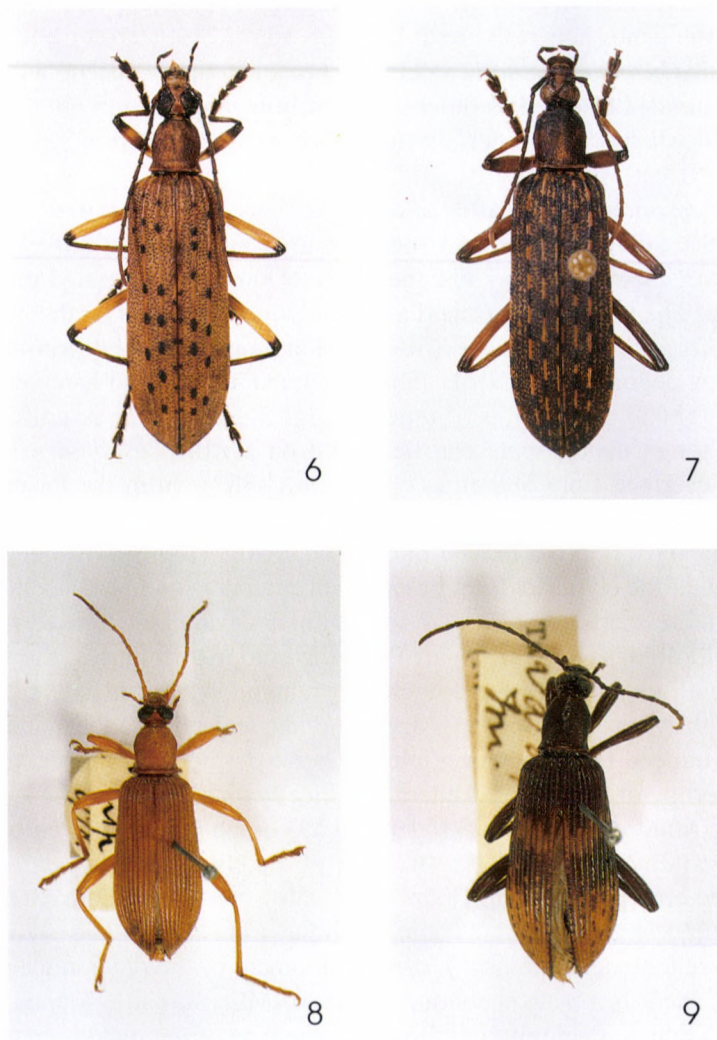
Distribution. All specimens available for study come from various parts of the Crocker Range in the East Malaysian state of Sabah. It is highly probable that the species is endemic to those mountains.

Remarks. Within the completely unsettled assemblage of the statirine genera, this species is placed in *Exostira* BORCHMANN, 1925 on account of emarginate apex of the last labial palpomere, general outline of the body and lack of sexual dimorphism of apical antennomeres. However, not to mention the size, the new species differs from all other *Exostira* in having uniquely formed surface of elytra, i.e. while all other species have punctural rows and lack longitudinal carinae, the elytra of the new species are irregularly punctate and have prominent carinae. Thus, this species would run to a group of genera which are entirely unrelated to *Exostira* in BORCHMANN's (1937: 235–241) key.

NOTES ON EXOSTIRA BORCHMANN, 1925

The general outline of the body and especially the elongate pronotum and the long, prognathous head make the species of *Exostira* superficially similar to various Oedemeridae. Indeed, specimens of *Exostira* (and many other members of the subtribe Statirina as well) are often found among unsorted Oedemeridae in many beetle collections. However, oedemerids have externally open procoxal cavities, conical to elongate and projecting procoxae, and their head is without neck. The procoxal cavities of Statirina are closed externally by the process of prothoracic hypomeron, the procoxae are more globular and the head has a distinct neck separated by a constriction.

A total of 23 described species of *Exostira* have been listed by BORCHMANN (1937) and a further species was added by PIC (1935), all are from the Oriental region. A revision of the genus would be the task of the future which should involve the examination of all types of PIC and FAIRMAIRE housed in the National Museum of Natural History in Paris. The above description of *E. borneana* sp. n. and a new synonymy proposed below do not alter the total number of known species.



Figs 6–9. 6 = *Exostira borneana* sp. n., female paratype (SBCB), 7 = *E. borneana* sp. n., male paratype (NHMW) (the darkest specimen in the material studied), 8 = lectotype of *Nemostira unipennis* FAIRMAIRE, 1882 (NNML), 9 = holotype of *Casnonidea variipennis* FAIRMAIRE, 1887 (NNML)

The only existing key of the genus (BORCHMANN 1937: 419–428) is quite difficult (in fact, almost impossible) to use for identification of species because of intraspecific variability of colour pattern and variable development of secondary sexual characters of male femora. At the moment only the following, fairly distinctive species could be recognized with certainty by the author without examining all types and revising the whole genus.

Exostira punctator BORCHMANN, 1930 has setigerous punctures on elytral intervals which are nearly as coarse as striae punctures; moreover, this is the only species of the genus hitherto known from Taiwan (MASUMOTO 1988).

Exostira bisbimaculata PIC, 1935 is a brownish orange beetle with two conspicuous, rounded black spots on each elytra. It is known from the northern part of Vietnam. All specimens seen by the author were collected in Tam Dao, Vinh Phu Province.

Exostira uncipectennis (FAIRMAIRE, 1882) (= *Casnonidea variipennis* FAIRMAIRE, 1887, **syn. n.**). These two species names are found in different couplets of BORCHMANN's (1937) key but the study of the types revealed that they are conspecific. The first was described as *Nemostira uncipectennis* on the basis of two specimens from Sumatra (FAIRMAIRE 1882) and one specimen from the locality "Koetoer" is deposited in NNML. This specimen, designated herewith as **lectotype**, is a female and obviously teneral (Fig. 8): its colour is uniformly light brown, although darker spots can be traced on elytra. *Casnonidea variipennis* was also described from Sumatra (FAIRMAIRE 1887), from the locality "Tandjong Morawa, Serdang". The unique type is also housed in NNML and regarded as **holotype**. This is also a female but fully coloured (Fig. 9): the general colour is dark brown, the elytra are light brown with extensive and partly confluent dark spots which are sparser on the posterior half and leave a pale transverse band before the middle of the elytra. Apart from the colour differences, the two specimens share all important features, including a uniquely shaped apex of elytra, i.e. apex is slightly concave, forming distinct outer and inner angles and the inner angle is produced to form a long, almost hooked spine. Moreover, the last abdominal sternite of both types is characteristically emarginate on the lateral sides. Although FAIRMAIRE (1882: 263, 1887: 159) emphasized differences between *uncipectennis* and *variipennis* in the structure of the elytral apex (*uncipectennis*: "elytris ... apice emarginato, angulo suturali arcuatim spinoso, angulo externo parum acuto"; *variipennis*: "elytris ... apice oblique truncato, angulo suturale dente acuto terminato, externo obtuso"), the development of the outer angle is a matter of degree. There is a male specimen in the NNML (Sumatra, Manna, 1901, M. KNAPPERT) which is entirely light brown as the type of *uncipectennis*, but the elytral apex is similar to *variipennis*. And inversely, a female specimen housed in the HNHM (Western Sumatra, Padang, VI. 1995, native leg.) has variegate pattern of

variipennis and acute outer edge of elytral apex of *uncipennis*. This confirms that these two names are conspecific.

* * *

Acknowledgements – Thanks are due to R. DE JONG (NNML), L. KLIMA (LKOC), H. SCHILLHAMMER (NHMW), S. BECVÁR (SBCB) and I. JENIŠ (IJNK) for making available specimens for study as well as to K. MASUMOTO (Yokohama) for donating specimens for the HNHM. Photographs were taken by I. RETEZÁR (Budapest). The drawings were made by J. PÁL (Budapest). The research was supported by the Hungarian Scientific Research Fund (OTKA grant no. T-017699).

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edited by Á. SOÓS, L. PAPP and P. OOSTERBROEK

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NEW RECORDS AND A NEW SPECIES OF OREGRIA MERKL FROM IRIAN JAYA (COLEOPTERA, TENEBRIONIDAE: LAGRIINI)*

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Oreogria riedeli sp. n. and the male of *O. wauana* MERKL, 1988 are described from Irian Jaya, New Guinea. Locality data of eight species of the genus are added. With 16 figures.

Key words: Coleoptera, Tenebrionidae, Lagriini, *Oreogria*, Irian Jaya, New Guinea, new species

INTRODUCTION

The lagriine genus *Oreogria* was erected by MERKL (1988) for 17 species endemic to New Guinea. Since the publication of that paper, further materials became available for the author. Almost all the material treated in this paper was collected in Irian Jaya Province, that is, the western (Indonesian) part of New Guinea. Only two specimens come from the opposite side of the border separating Irian Jaya from Papua New Guinea.

The major part of the material was borrowed from the Nationaal Natuurhistorisch Museum (Leiden) and consists of three collections. The first was brought back by the Third Archbold Expedition (indicated as Neth. Ind.-Amer. New Guinea Exp. on locality labels) in 1938–1939 as a result of extensive work by the Dutch entomologist L. J. TOXOPEUS (ARCHBOLD *et al.* 1942) in the northern slope of the Snow Mountains. The second collection was organized by the Royal Netherlands Geographical Society (indicated as Nieuw Guinea Exp. K. N. A. G. on locality labels) and was performed in 1939 in the Nassau Mts., Wissel Lakes and Etna Bay (FRODIN & GRESSITT 1982); specimens of *Oreogria* are from the Paniai Lake area (3°50'S, 136°15'E). The third collection was gathered in 1959 by an expedition led by L. BRONGERSMA and G. F. VENEMA (indicated as Neth. New Guinea Exp. on locality labels) to the Star Mountains.

The smaller (but not less interesting) part of the investigated material was collected between 1991 and 1993 by the private coleopterist A. RIEDEL (Munich, Germany), also in the Snow Mountains.

* 13th contribution to the knowledge of Lagriini.

These materials provided a number of specimens from the already known localities as well as new locality records. A new species, *Oreogria riedeli* sp. n. was also found; furthermore, the male of *O. wauana* and the female of *O. gentilis* were discovered as well.

The following acronyms are used for indicating depositories of the specimens (persons responsible for loans are in parentheses): BPBM – Bernice Pauahi Bishop Museum, Honolulu, USA (G. A. SAMUELSON); HNHM – Hungarian Natural History Museum, Budapest, Hungary; HPCW – HORNABROOK's private collection, Wellington, New Zealand (R. W. HORNABROOK and R. L. PALMA); NNML – Nationaal Natuurhistorisch Museum, Leiden, The Netherlands (R. DE JONG); SMNS – Staatliches Museum für Naturkunde, Stuttgart, Germany (W. SCHAWALLER).

Oreogria gentilis MERKL, 1988

Material examined. Irian Jaya: Neth. Ind.-Amer. New Guinea Exp., [Snow Mountains,] Araucaria Camp, 800 m, III.1939, L. J. TOXOPEUS (3, NNML, 1, HNHM); Prov. Jayawijaya, Wamena, Kosarek, 1650–1700 m, 25.IX.1991, A. RIEDEL (1, SMNS).

Remarks. The species was described on the basis of a single male from the Wissel Lakes while the new material consists of one male and four females. The females are very much similar to those of *kaszabi* and *samuelsoni*. In fact, females of these three species are difficult to separate if they are not associated to males, although fore tibia of female *kaszabi* is a little shorter and more robust than in *samuelsoni* and *gentilis*. Three females from the Araucaria Camp are associated to a male with which they share similar sculpture and colour pattern of elytra and have distinctively pale reddish pronotum. The pronotum of a single female from Wamena is similarly reddish – all known females of *kaszabi* and *samuelsoni* have blackish brown pronotum.

Oreogria irianica MERKL, 1988

Material examined. Irian Jaya: Nieuw Guinea Exp. K. N. A. G., Araboebivak, 28.X.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Araboebivak, 7.X.1939 (1, NNML, 1, HNHM); Nieuw Guinea Exp. K. N. A. G. Araboebivak, 8.X.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Araboebivak, 9.X.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Paniai, 22.IX.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Paniai, 27.VIII.1939 (1, NNML).

Remarks. The holotype and eight paratypes of this species are from the Wissel Lakes, while one paratype is from New Britain. The present material is similar to the type series in all respects.

Oreogria kaszabi MERKL, 1998

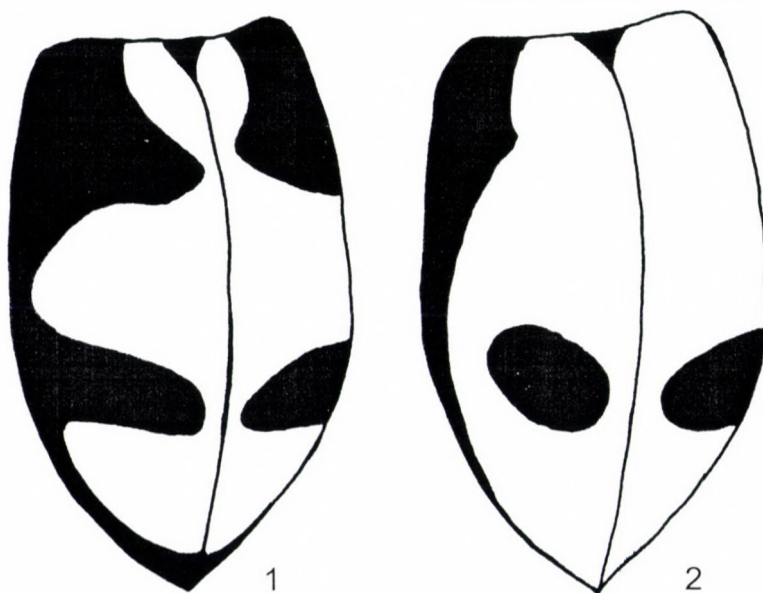
Material examined. Irian Jaya: Star Range, 1260 m, Sibil, between 11. IV and 26. VII 1959, Neth. New Guinea Exp. (80, NNML, 14, HNHM; some specimens with "op licht" or "op ultra violet licht"); Star Range, 1300 m, Bivak 39, 28. VI. 1959, Neth. New Guinea Exp. (2, NNML); Star Range, 1300 m, Bivak 39, 26. VII. 1959, Neth. New Guinea Exp. (3, NNML); Star Range 1500 m, Ok Tenma, op licht, 19.V.1959, Neth. New Guinea Exp. (1, NNML); Star Range, 1800 m, Tenma Sigin, 20. V. 1959, Neth. New Guinea Exp. (1, NNML). Papua New Guinea: Western Papua New Guinea, Star Mountains, Kerobip, 5000 ft., no date, R. W. HORNABROOK (1, HPCW).

Remarks. This species, type of the genus, is by far the most numerous *Oreogria* in the combined material of collections seen by the author. It was described from Sibil Valley of the Star Mountains and also known to occur in the Southern Highlands province of Papua New Guinea.

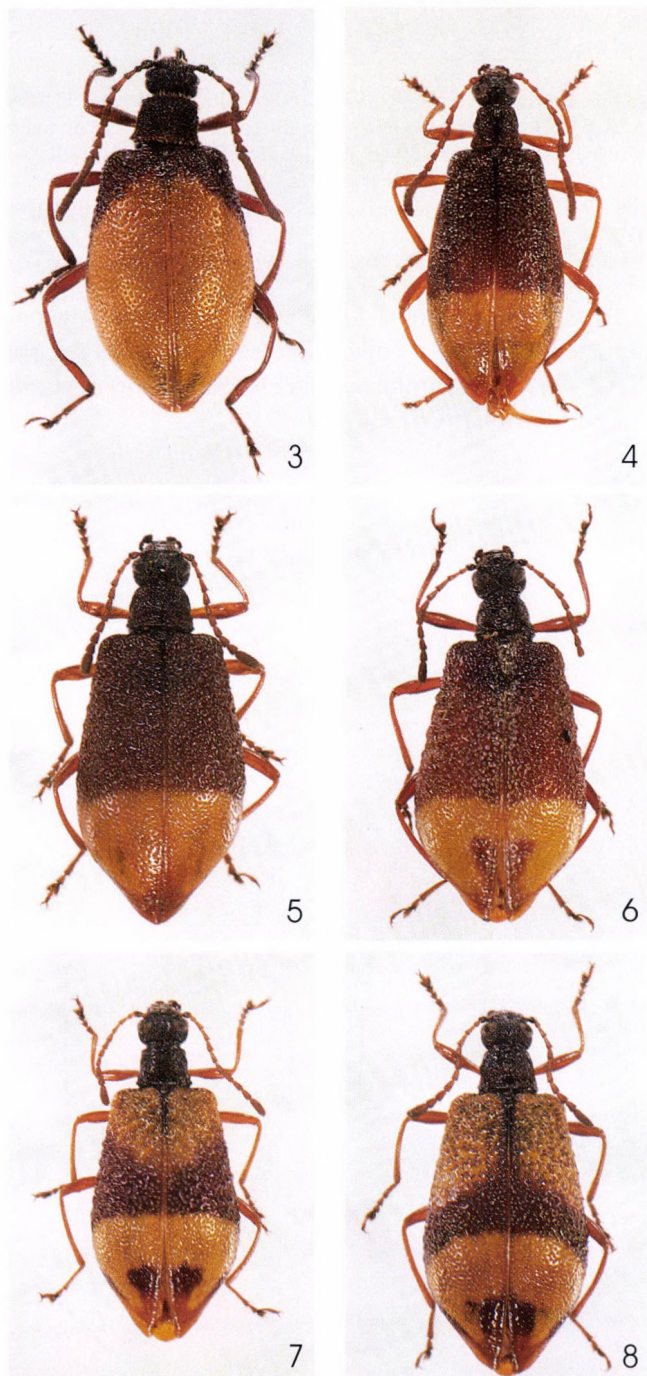
Oreogria larvata MERKL, 1988

(Figs 1–2)

Material examined. Irian Jaya: Neth. Ind.-Amer. New Guinea Exp., [Snow Mountains,] Moss Forest Camp, 2800 m, 9.X.-5.XI.1938, L. J. TOXOPEUS (3, NNML, 1, HNHM); Neth. Ind.-Amer. New Guinea Exp., [Snow Mountains,] Moss Forest Camp, 3050 m, 25.X.1938, L. J. TOXOPEUS (1, NNML); Jayawijaya, zw[ischen]. Theila u[nd]. Habbema-See, 2800–2950 m, 22.X.1993, A. RIEDEL (1, SMNS).



Figs 1–2. Elytral pattern of *Oreogria larvata* MERKL, 1988: 1 = specimen from Snow Mountains, Irian Jaya, 2 = specimen from Morobe Province, Papua New Guinea



Figs 3–8. 3 = *Oreogria wauana* MERKL, 1988, male, 4 = *O. riedeli* sp. n., holotype, male, 5–8 = *O. riedeli* sp. n., female paratypes

Remarks. This species was described from Morobe and Central provinces of Papua New Guinea. The dark elytral pattern of Irian Jaya specimens (Fig. 1) is more extensive than that of specimens from Papua New Guinea (Fig. 2), i. e. the large, oblique dark spot in the posterior half of the elytra reaches the lateral margin and is continuous with the dark colouration of humerus and apex. In spite of these differences and the considerable distance between the known areas, the Snow Mountains and Papua New Guinea the populations are considered to be conspecific, since they share all structural features distinctive to the species (curved, robust and thickened fore tibia, blunt tooth of hind tibia, proportions of antennomeres, shape and punctuation of pronotum).

Oreogria lutea MERKL, 1988

Material examined. Irian Jaya: Neth. Ind.-Amer. New Guinea Exp., [Snow Mountains,] Moss Forest Camp, 2800 m, 9.X.-5.XI.1938, L. J. TOXOPEUS (1, NNML).

Remarks. This species was described from the central part of the Papua New Guinea highlands. The sole female does not differ from the type specimens.

Oreogria samuelsoni MERKL, 1988

Material examined. Irian Jaya: Nieuw Guinea Exp. K. N. A. G. Araboebivak, 7.X.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Araboebivak, 16.X.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Paniai, 13.IX.1939 (1, NNML); Nieuw Guinea Exp. K. N. A. G. Paniai, between 24.VIII. and 12.XI. 1939 (6, NNML, 1, HNHM).

Remarks. The species was described from the Wissel Lakes. The present material is similar to the type series in all respects.

Oreogria torva MERKL, 1988

Material examined. Irian Jaya: Prov. Jayawijaya, Djuremna, 1900–2100 m, 9–11.IX.1992, A. RIEDEL (4, SMNS, 2, HNHM); Prov. Jayawijaya, Nalca, 1900–2100 m, 8.IX.1992, A. RIEDEL (1, SMNS).

Remarks. The species was described from the Papua New Guinea side of the Star Mountains (Feramin and Telefomin). The Irian Jaya specimens from the Snow Mountains are similar to the type series in all respects.

Oreogria wauana MERKL, 1988

(Figs 3, 9–12)

Material examined. Irian Jaya: Neth. Ind.-Amer. New Guinea Exp., [Snow Mountains,] Top Camp, 2100 m, between 20.I. and 30.I.1939, L. J. TOXOPEUS (5, NNML, 1, HNHM); Prov. Jayawijaya, Eipomek, 1800–2300 m, 19.VIII.-6.IX.1992, A. RIEDEL (1, SMNS) (Fig. 3).

Description of male. Interocular distance about as broad as eye diameter. Eyes rather small and flat. Antennomere 10 transverse, antennomere 11 as long as 7 preceding segments combined. Pronotum transverse, subquadrate, with two vague impressions. Head, left antenna and pronotum: Fig. 9. Legs moderately long and slender. Fore tibiae curved, slightly thickening toward apex, not spatulate (Fig. 10). Middle tibiae evenly curved, gradually widened toward apex (Fig. 11). Hind tibiae strongly curved, apical 2/5 abruptly widened, without tooth at inner side (Fig. 12). Abdominal sternites 1 and 2 impressed mesally. Habitus: Fig. 3.

Remarks. This species was described from the Morobe province of the Papua New Guinea highlands on the basis of two females. The present material consist of five females and two males. The males are similar to those of *lutea*, but, apart from the differences in colouration, can be easily separated by the lack of prominent tooth in the inner side of hind tibiae.

Oreogria riedeli sp. n.

(Figs 4–8, 13–16)

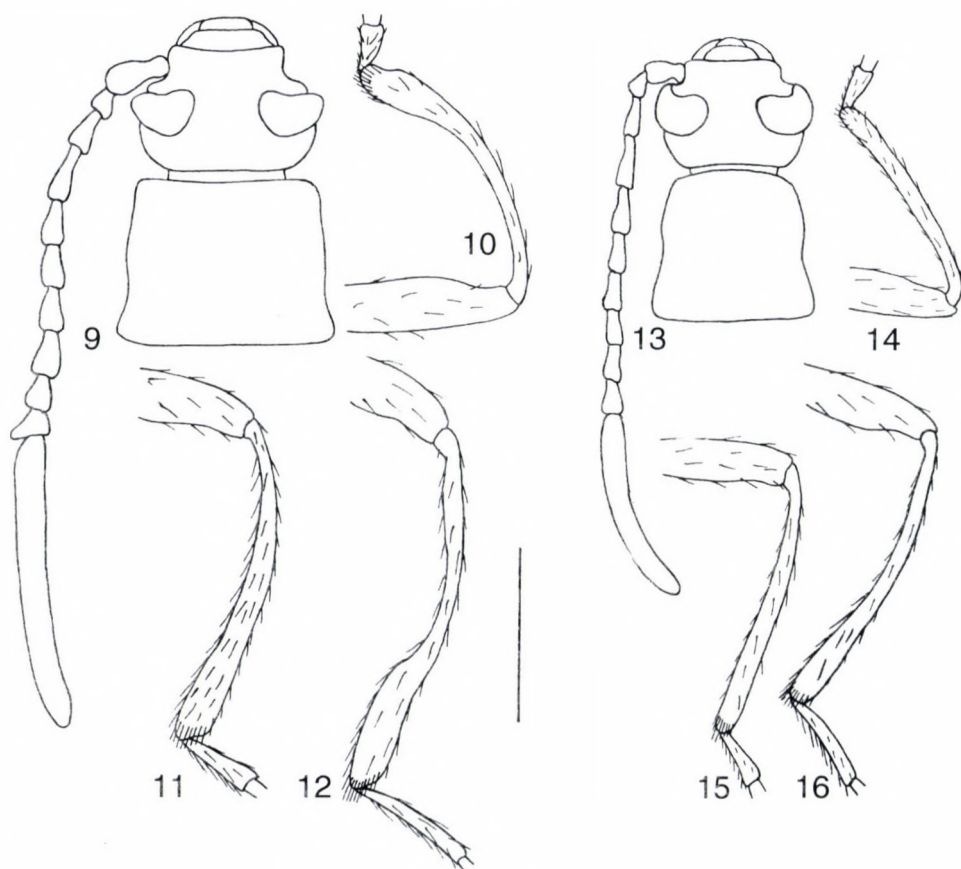
Type material. Holotype, male (SMNS) (Fig. 4), labelled as follows: "Irian Jaya: Jayawijaya Paß Habbema-See/ Wamena-Tal 19.-20. 10. 1993, A. RIEDEL 3450 m"; "Holotypus ♂ *Oreogria riedeli* Merkl, 1999". Paratypes. Irian Jaya: same as holotype (4 ♀♀, SMNS; 1 ♂, 1 ♀, HNHM); Jayawijaya, G[u]n[un]g. Elit, Siam, 3200 m, 12–13.X.1993, A. RIEDEL (2 ♀♀, SMNS; 1 ♀, HNHM); Prov. Jayawijaya, Wamena, G[u]n[un]g. Elit, 3500–3300 m, 25–27.IX.1992, A. RIEDEL (1 ♂, SMNS); Jayawijaya, Kono-Pinji, 2800 m, 6.X.1993, A. RIEDEL (2 ♀♀, SMNS; 2 ♀♀, HNHM).

Description. Body moderately slender, moderately convex. Head and pronotum dark brown to black. Elytra metallic brown about up to level of posterior margin of abdominal sternite 2; this part of elytra coarsely and sparsely punctate, interspaces unevenly raised, forming vermiculate elevations. Rest of elytra yellow, finely and sparsely punctate, almost impunctate before apex. Demarcation line between dark and yellow colourations sharp (Figs 4–5). Lateral margin, apex and preapical part of sutura forming a common, cordiform or elongate spot may be brownish in variable extent as well (Figs 6–8); in some specimens, a large periscutellar area is also yellowish (Figs 7–8). Thoracal sternites black, metasternum sometimes reddish brown to some extent; abdominal sternites reddish. Legs and antennae reddish; antennae sometimes infusate toward apex and on antennomere 1. Pronotal punctation coarse and scattered, punctures separated by distances at least equal to diameter. Elytra slightly caudate. Length 9.5–11.6 mm.

Male. Interocular distance somewhat narrower than eye diameter. Eyes moderately convex. Antennomere 10 not transverse, antennomere 11 as long as 5 preceding combined. Pronotum at base about as broad as long, weakly constricted before base, with 2 oblique lateral impressions. Head, left antenna and pronotum: Fig. 13. Legs long and gracile. Fore tibiae almost straight, practically not widening toward apex (Fig. 14). Middle tibiae slightly curved, weakly widened at apical 1/3 (Fig. 15). Hind tibiae moderately curved, narrowest at middle then widening toward apex (Fig. 16). Abdominal sternites 1 and 2 with shallow longitudinal impression mesally.

Female. Interocular distance about as broad as eye diameter. Antennomere 11 as long as 2 preceding combined. Pronotum broader. Elytra broader and more convex.

Remarks. The slender body and long legs of males are much similar to *Oreogria fragilipes* and *vermiculata*. The fore tibiae are straight as in *fragilipes* (curved in *vermiculata*) while colour pattern with sharp demarcation line between dark and pale parts of the elytra is similar to *vermiculata* (demarcation line is ill-defined in *fragilipes*). However, in the key to the species (MERKL 1988: 250–251), *riedeli* sp. n. would run to the group of *kaszabi*, *samuelseni* and *gentilis* because of the proportions of antennomeres. All these species are similar in the shape of male antennomere 10 which is not transverse and in the relative length of antennomere 11 which is at most as long as 5 preceding antennomeres. The



Figs 9–16. 9–12 = *Oreogria wauana* MERKL, 1988, male: 9 = head, left antenna and pronotum, 10 = fore tibia, 11 = middle tibia, 12 = hind tibia. 13–16 = *Oreogria riedeli* sp. n., male: 13 = head, left antenna and pronotum, 14 = fore tibia, 15 = middle tibia, 16 = hind tibia. Scale = 1 mm

new species differs from the three last mentioned species in the colour pattern and much more slender body.

The following change in the existing key to the species of *Oreogria* (MERKL 1988: 250) will accomodate *riedeli* sp. n.:

- 5 (6) Yellowish part of elytra with a poorly defined transverse brown spot at middle. Antennal segment etc. *torva* MERKL
- 6 (5) Yellowish part of elytra without brown spot or with a common cordiform or elongate spot immediately before apex.
- 7 (12) Antennomere 10 of male not transverse; antennomere 11 as long as 3 to 5 preceding combined.
- 7a (7b) Elytra with basal 2/3 reddish brown; periscutellar area sometimes paler; yellowish part of elytra sometimes with brown preapical spot. Fore tibiae of male nearly straight, neither dilated nor claviform at apex. Size larger on average (9.5–11.6 mm) ***riedeli* sp. n.**
- 7b (7a) Elytra with at most basal 1/4 reddish brown; yellowish part of elytra without brown marking. Fore tibiae of male more or less dilated or claviform at apex. Size smaller on average (7.5–11.3 mm).
- 8 (9) Apex of fore tibiae etc. *kaszabi* MERKL

*

It is beyond doubt that further species of *Oreogria* will be discovered in the yet incompletely explored parts of the New Guinea mountains. This is indicated by the fact that after most of the *Oreogria* specimens were pigeonholed by the author, a few "leftovers" remained unidentified. These specimens are all females, so their description as new species would be premature and should be postponed until reliably associated males will be available. They are the following:

Oreogria sp. 1 – Irian Jaya: Anggi, Gn. Kobrey, 2200–2300 m, 21.III.1993, A. RIEDEL (1, SMNS); Minyambou, 1500–1900 m, 13–14.IV.1993, A. RIEDEL (1, SMNS). – These two small specimens have black head and prothorax as well as a few conspicuous, large, elevated and impunctate swellings on the elytra.

Oreogria sp. 2 – Irian Jaya: Prov. Jayawijaya, Bommela, 1750 m, 30.VIII.-1.IX.1992, A. RIEDEL (1, SMNS). – It is much similar to *O. torva*, but lacks the transverse ovoid spot on the yellowish part of elytra, and the pronotum is much more transverse.

Oreogria sp. 3 – Irian Jaya: Jayawijaya, Okloma, 1650–1800 m, 30.IX.-1.X.1993, A. RIEDEL (1, SMNS). – It is similar to *O. riedeli* sp. n., but legs and antennae dark brownish black, the dark part of elytra is less coarsely sculptured and restricted to basal 1/3.

Oreogria sp. 4 – Irian Jaya: Neth. Ind.-Amer. New Guinea Exp., [Snow Mountains,] Iebele Camp, 2260 m, XI-XII. 1938, L. J. TOXOPEUS (1, NNML). – It has dark brown elytra with a common yellowish, ovoid spot at middle.

Oreogria sp. 5 – Papua New Guinea, Mt. Wilhelm, 2600–3000 m, 2.VII.1963, J. Sedlacek (BPBM). – This distinctively patterned specimen has almost tricoloured elytra with darker yellowish apex and a transverse, bright yellow band on dark brown background. The elytra are depressed in basal half.

*

Acknowledgements – Thanks are due to all persons (listed in the Introduction) who have sent material for study. The photographs (Figs 3–8) were kindly taken by I. RETEZÁR (Budapest). Figs 1–2 were produced by Mrs. J. GEÖNCZY (Budapest). The research was supported by the Hungarian Scientific Research Fund (OTKA grant no. T-017699).

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TWO NEW SAWFLIES FROM YUNAN (HYMENOPTERA: TENTHREDINIDAE)

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Abstract: Two new Tenthredinidae species *Poppia yunanensis* sp. n. and *Siobla yunanensis* sp. n. are described below.

Key words: *Poppia yunanensis* sp. n., *Siobla yunanensis* sp. n., Tenthredinidae, China

In 1993–95 three expeditions were made to the southern provinces of China, mainly to Yunan. These provinces are transitional territories between the Oriental and East-Palaearctic region. Here we publish the descriptions of two new species from this material (78 specimens, 63 species). The new *Poppia* species is the most interesting one because the genus *Poppia* has been considered to be monotypic until now. The genus was described by KONOW (1904). The only known species of this genus is *Poppia athaloides* KONOW, 1904.

***Poppia yunanensis* sp. n.**

Figs 1–2, 6, 8)

Male. Head, antenna and thorax black. Tegulae and legs completely yellow. The whole body smooth and shining only the upper half of hind orbit with one row of deep punctures. Inner margin of eyes parallel. POL : OOL : OCL = 1.9 : 1.0 : 1.3. Clypeus truncate. Malar space linear. Head narrowed behind the eyes. Antenna with 9 joints, densely covered with short black pubescence. Scapus distinctly longer than pedicellus. Length of 3rd/length of 4th antennal segment = 1.4. Length/maximal width of 8th antennal segment = 2.2. Length of antenna/length of costa = 0.8. Pubescence of mesopleuron about as long as the diameter of front ocellus. Mesonotum bald. Cenchri brownish-white. Length of cenchrus/distance of the two cenchri = 1.0. Tibiae and tarsi with dense and white pubescence. Pubescence of trochanters, coxae and femora sparse. Apical teeth of claws longer than subapical ones. Claws with well developed basal lobes (Fig. 8). Wings infusate, venation and stigma black. Distance of basalis and the origin of cubitus shorter than the length of nervulus. Fore wing with 4 cubital and 3 discoidal cells. Second discoidal cell large and pentagonal. Basalis and the 1st recurrent vein convergent. Length of fore wing: 4.0 mm. Hind wing with one closed cubital and discoidal cell but without marginal vein (Fig. 6). Abdomen brownish-yellow, bald and elongated without surface sculpture. Penis valve as in Fig 1. Length: 4.8 mm.

Holotype: male. "China, Yunan, Baoshan env., 5–8 VI. 1993, E. Jednek, O. Sausa leg."

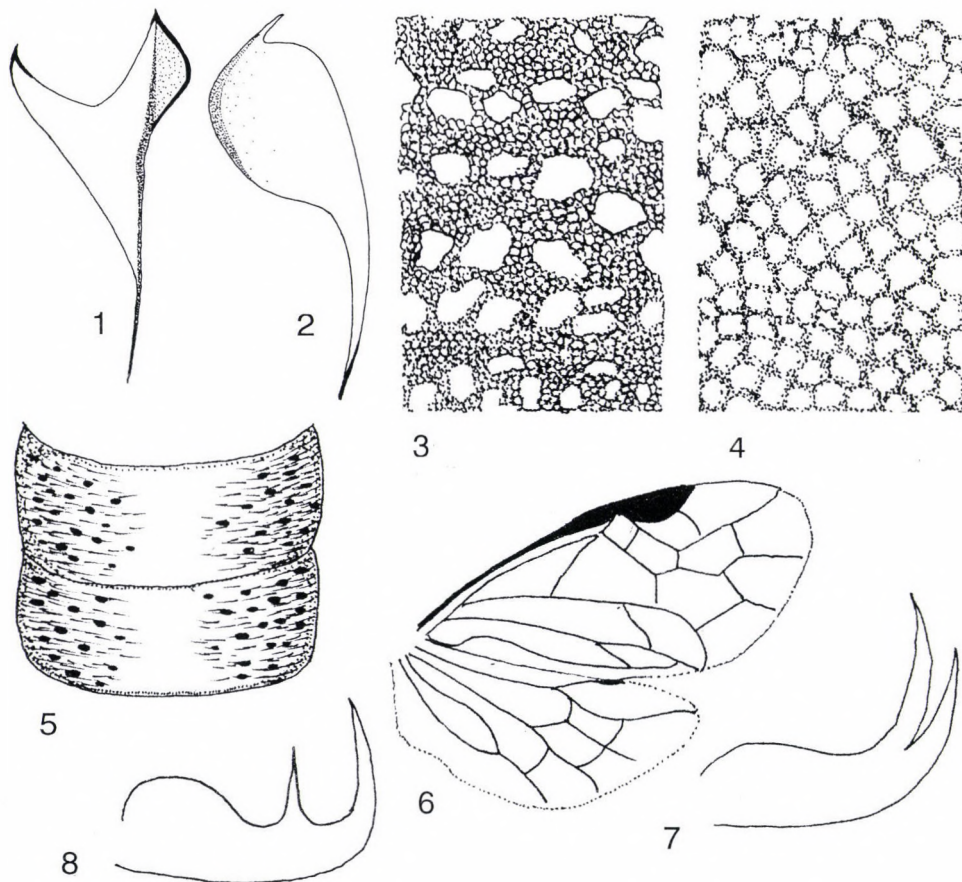
Holotype is deposited in the Department of Zoology, Hungarian Natural History Museum, Budapest.

Remarks. The new species is related to *Poppia athaloides* KONOW, 1904. The mouthparts, supraclypeal area, lower inner orbit, pronotum and mesopleuron of *P. athaloides*, however, are yellow; its first abdominal tergite is black and wings are hyaline. Penis valve as in Fig. 2.

***Siobla yunanensis* sp. n.**

Figs 3–5, 7)

Female. Head black, clypeus and mandibles yellowish-brown, base of mandibles black. Vertex and temples deeply, very roughly but uniformly punctured without interspaces. Head with occipital carina, POL : OOL : OCL = 2.2–3.0 : 1.0 : 1.8–2.1. Clypeus truncate, head behind the eyes dilated and strongly contracted at the temples. Antenna brownish-yellow. Length of antenna/length



Figs 1–8. Penis valve (lateral view): 1 = *Poppia yunanensis* sp. n., 2 = *P. athaloides* KONOW, 1904; 3–5: Surface sculpture of *Siobla yunanensis* sp. n.: 3 = propleuron, 4 = pronotum, 5 = 3rd–4th abdominal segments; 6 = Wing venation of *Poppia yunanensis* sp. n., 7–8: hind leg claw: 7 = *Siobla yunanensis* sp. n., 8 = *Poppia yunanensis* sp. n.

of costa = 0.8. Length of 3rd/length of 4th antennal segments = 1.5–1.8. Thorax black, hind margin of pronotum yellow. Pronotum densely and moderately roughly punctured (Fig. 4), propleuron with very dense and fine transverse sculpture (Fig. 3). Mesonotum densely, moderately roughly and uniformly punctured without interspaces, mesoscutellum deeply and very roughly punctured, mesoscutellar appendage finely granulated. Metascutellum finely punctured. Mesopostnotum shining, moderately densely punctured with interspaces 1–2 times as large as the diameter of a puncture. Metapostnotum with fine transverse sculpture. Mesepimeron shining, with irregular transverse sculpture, mesepisternum roughly, deeply and uniformly punctured. Metepimeron and metepisternum shining, densely and finely punctured (similar to Fig. 4 but even more finely). Mesosternum shining, deeply punctured with interspaces about 1/2–1 times as large as the diameter of a puncture. Head and thorax covered with white pubescence about as long as the diameter of front ocellus. Mesonotum with hairs 1/3 as long as the diameter of front ocellus. Cenchri white. Distance of the two cenchri/length of cenchrus = 2.2. Coxae black. Fore and middle trochanters black, hind trochanter black with a small yellow spot. Femora black, fore and middle femora with yellow spots on dorsal surface and hind femur with a minute yellow spot at its base. Tibiae and tarsi yellow, apical 1/3 and basal 1/5 of hind tibia black. Length of inner hind tibial spur/length of hind basitarsus = 2.5–2.6. Subapical teeth of claws longer and wider than the apical ones. Claws with slightly developed basal lobe (Fig. 7). Wings yellowish hyaline, venation black, base of longitudinal veins yellow, apical third of subcosta brown, stigma dark yellow. Length of fore wing: 11.4–12.2 mm. Abdominal tergites black, 2nd–4th (holotype) or 2nd–3rd (paratype) and 8–9th tergites yellow. Abdominal sternites: 2nd–3rd and 8–9th entirely, 4th dominantly, 5th and 7th in the middle yellow, 6th black. First abdominal tergite finely granulated, 2nd–9th with transverse sculpture and with sporadic deep punctures (Fig. 5). Apical half of sawsheath yellow with two lateral black spots, basal half black with two elongated yellow spots. Length: 11.0–11.6 mm.

Holotype: female: "China, Yunan, 50 km N. of Lijang, Yulongshan Nat. Res. 24–29. V. 1993 E. Jednek, O. Sausa leg." Paratype: one female, labelled as the holotype. Holotype is deposited in the Department of Zoology, Hungarian Natural History Museum, Budapest; paratype in the collection of the Slovak National Museum, Bratislava.

The new species runs to *Siobla ruficornis* (CAMERON, 1876) in MALAISE's (1933) key. Later, Malaise revised his key (MALAISE 1945) wherein the new species runs to *Siobla frigida* (MOCSÁRY, 1909).

Remarks. The 3rd–6th abdominal tergites and all sternites and base of hind femora of *Siobla ruficornis* (CAMERON, 1876) are yellow and its apical tergites are black. *Siobla frigida* (MOCSÁRY, 1909) has black apical tergites and 4–9th sternites while basal third of hind femora are yellow.

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BRACONIDAE (HYMENOPTERA) FROM MONGOLIA, XIII: ALYSIINAE*

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Twenty-eight braconid species belonging to the tribe Alysini (subfamily Alysinae) are reported from Mongolia. Ten species are described as new to the science: *Dinotrema amoepilosum* sp. n., *D. brevimeres* sp. n., *D. flaviantenna* sp. n., *D. kaszabi* sp. n., *D. pembedum* sp. n., *D. propelamur* sp. n., *D. remotum* sp. n., *D. tosgonii* sp. n., *D. tuber* sp. n. and *Synaldis kaszabiana* sp. n. Thirteen species are new to the fauna of Mongolia. A checklist of the species of the *Aspilota* genus-group in the East Palearctic Region is presented. With 67 original figures.

Key words: taxonomy, faunistic data, new species, checklist, Mongolia

INTRODUCTION

In my series this is the third contribution of the Alysini (subfamily Alysinae) species of Mongolia; in the first two contributions 31 species have been reported (PAPP 1967, 1991); in the present report twenty-eight are listed. Collectively these belong to six genera as follows (numbers of respective species are given between parentheses): *Alloea* HALIDAY (1), *Alysia* LATREILLE (1), *Dinotrema* FOERSTER (17), *Pentapleura* FOERSTER (1), *Phaenocarpa* FOERSTER (4) and *Synaldis* FOERSTER (4). Nine *Dinotrema* and one *Synaldis* species proved to be new to science, their specification is given in the abstract. The braconid material here elaborated was collected by the late Dr. Z. KASZAB (1915–1986) and is deposited in the Hungarian Natural History Museum, Budapest. Detailed collecting data are presented for every species in an abbreviated form, i.e. only KASZAB's collecting numbers ("No.") are indicated after the species names, the full collecting data (name of the localities, dates, etc.) are compiled under the heading "List of the collecting localities" before the faunistic contribution. Where necessary taxonomic, faunistic and zoogeographic notes are added.

* Ergebnisse der zoologischen Forschungen von Dr. Z. KASZAB in der Mongolei, Nr. 507.

LIST OF THE COLLECTING LOCALITIES

(See Z. KASZAB's six reports of his collecting trips to Mongolia in Folia ent. hung. 1963–1968 vols 16–21.)

- No. 295. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 12 km SO vom Zentrum, 1600 m, 22.VIII.1965. Am Waldrand gesiebt.
- No. 297a. Same as No. 295, 5 Bodenfallen mit Ethylenglykol an der steinigen, steppigen Bergseite südlicher Exposition, 22.VII.–27.VIII.1965.
- No. 297b. Same as No. 295, 1600–1700 m, 22.VII.1965, 10 Bodenfallen mit Ethylenglykol im Walde, auf der nördlichen Bergseite, aufgenommen am 27.VIII. 1965.
- No. 416. Cojbalsan aimak: 160 km W vom See Bujr nur, Menengijn Tal, 600 m, Federgras-Steppe, viele *Artemisia*, *Linaria* etc., gekötschert, 15.VIII.1965.
- No. 504. Central aimak: Songino, 24 km SW von Ulan-Baator, 1300 m, im Galeriewaldes Überschwemmungsgebietes gekötschert, 7.VI.1966.
- No. 523. Central aimak: etwa 30 km O von Somon Nalajch, 1530 m, gekötschert im feuchten Talgrund sowie an den trockeneren, kahlen Berghängen bis zum Waldrand, 14.VI.1966.
- No. 552. Bajanchongor aimak: Changaj Gebirge, Ulaan olon, 18 km S von dem Pass Egijn davaa, 2300 m, 21.VI.1966, 8 Bodenfallen mit Ethylenglykol (aufgenommen am 18.VII.1966) an dem steinigen Talgrund neben dem Bach.
- No. 926. Central aimak: Tosgoni ovoo, 5–10 km N von Ulan-Baator, 1500–1700 m, an den Südhängen der Gebirgsteppe, am Nordhang mit einem Birkenwald, gekötschert, 19.–20. und 23.–24.VII.1967.
- No. 926a. Same as No. 926, 10 km N von Ulan-Baator, 1700–1900 m, gekötschert am Waldrand und auf den Hochgebirgssteppen, 23.–24.VII.1967.
- No. 931. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 12 km SO vom Zentrum, 1500–1600 m, mit sehr üppiger Vegetation bedeckter Talgrund neben dem Bach, im Talgrund gekötschert, 21.VII.1967.
- No. 938. Same as 926, gekötschert im Birkenwald, am Waldrand und auf den Wiesen der Nordhänge von blühendem Gesträuch, von Birken, Weiden und aus Unterholz, 7.–8.VI.1968.
- No. 945. Central aimak: 11 km OSO von Somon Bajanzogt, 1600 m, 13.VI.1968, 10 Ethylenglykol-Bodenfallen im Wald eingegraben (aufgenommen am 26.VII.1968).
- No. 961. Bulgan aimak: zwischen Somon Chischig-Öndör und Somon Orchon, 23 km NNO von Chischig-Öndör, 1390 m, bewaldetes Hügelland, ausgedehnte Birken- und Nadelholzwälder, an Waldrändern Gebüsch, im Talgrund nasse Wiesen, am Waldrand und auf der Steppe gekötschert, 15.VI.1968.
- No. 967. Bulgan aimak: 7 km NW von Somon Chanargalant, 1350 m, nach W auslaufendes Tal, steile Berghänge, am Nordhang alter Nadelholzwald, am Südhang steinige Gebirgsteppe mit Gebüsch, der Talgrund mit Waldlichtungen und blühendem Unterholz, gekötschert am Waldrand und im Tal, 16.VI.1968.
- No. 973. Bulgan aimak: Namnam ul Gebirge, 23 km NW von Somon Chutag, 1150 m, an den Berghängen junge Nadelholzwälder und Birkenwald, im letzteren mit alleinstehenden, sehr alten Birken und sibirischen Zedern, im Talgrund neben dem Bach Weidengebüsch und ausgedehnte Gebirgssteppe, gekötschert, 17.VI.1968.
- No. 1032. Uvs aimak: zwischen dem See Örög nuur und der Stadt Ulaangom, 2–7 km OSO vom Pa Ulaan davaa, 1690–1950 m, gekötschert am steilen Nordhang, am Rande des Nadelholzwaldes und am blühenden Gebüsch, 28.VI.1968.
- No. 1069. Uvs aimak: am östlichen Hang des Passes Ulaan davaa, zwischen See Örög nuur und der Stadt Ulaangom, 2050 m, Hochgebirgsteppe, von blühenden *Galium*, *Thermopsis*, *Artemisia* gekötschert, 6.VII.1968.

- No. 1091. Uvs aimak: 3 km NO von Somon Öndörchangaj, Gebirge Chanchöchij ul, 2200 m, alpine Zone, im Talgrund Schnee und Eis, an den Nordhängen Nadelholzwald, an den Waldrändern blühendes Unterholz, gekötschert, 11.VII.1968.
- No. 1107. Chövsgöl aimak: Alag Mort, 42 km NO vom Pa Chaldzan Sogotyn davaa, am Fluß Tejsijn gol, 1900 m, an den Nordhängen Nadelholzwälder, sonst Gebirgsteppe, an den Waldrändern und an Wasserrien üppige Vegetation und blühende Pflanzen, an den Hängen trockene Steppe, gekötschert im Wald und an den Waldrändern, 14.VII.1968.
- No. 1123. Chövsgöl aimak: N von Somon Chatgal am SW-Ecke des Sees Chövsgöl nuur, 1650 m, am Seeufer Nadelholzwald, stellenweise mit Lichtungen, an den Waldrändern und in Lichtungen blühende Pflanzen, gekötschert, 18.VI.1968.
- No. 1150. Central aimak: 11 km OSO von Somon Bajazogt, 1600–1700 m, am Nordhang ausge dehnte Birkenwälder, im Talgrund nasse Wiesen, sonst üppige Steppenvegetation, gekötschert, 26.VII.1968.

FAUNISTIC LIST

SUBFAMILY ALYSIINAE

Alloea contracta HALIDAY, 1833 – Rather sporadically distributed in Europe. New to the fauna of Mongolia. – Localities: 1 ♀ No. 295. 1 ♀ No. 297b.

Alysia (Alysia) alticola (ASHMEAD, 1890) (?=*Alysia soror* MARSHALL, 1894) – I concur with WHARTON's (1986: 495) comment that MARSHALL's species (*Alysia soror*) seems to be identical with *A. alticola* (sen. name). More material is needed to decide unambiguously this taxonomic problem. Reported from the Nearctic Region (Canada, USA) from many localities (WHARTON l.c.); new to the fauna of Mongolia (and the Palaearctic Region). *A. soror* is known from England (FISCHER 1966: 190) and Russia: Kola Peninsula (TOBIAS 1986: 107). – Locality: 1 ♀ No. 297b.

Dinotrema amoepilosum sp. n.: for description see p. 225.

Dinotrema aureliae (FISCHER, 1973) – Described from Austria, new to the fauna of Mongolia. – Locality: 1 ♀ No. 926.

Dinotrema brevimeres sp. n.: for description see p. 227.

Dinotrema catharinae (FISCHER, 1973) (?=*Aspilota perlustranda* FISCHER, 1973) – Described from Austria, new to the fauna of Mongolia. – Locality: 3 ♀ No. 926a. 1 ♂ No. 961. 1 ♀ No. 1150.

Dinotrema flaviantenna sp. n.: for description see p. 228.

Dinotrema glabra (STELFOX et GRAHAM, 1951) – Described from Ireland, new to the fauna of Mongolia. – Localities: 2 ♀ + 1 ♂ No. 926. 4 ♀ + 1 ♂ No. 926a. 1 ♀ No. 931.

Dinotrema kaszabi sp. n.: for description see p. 229.

Dinotrema lineola (THOMSON, 1895) – Propodeum medially with a wide areola (FISCHER 1972: 403–406), that of the Mongolian specimen with a strong transverse keel anteriorly (i.e. without areola: teratological deviation or specific difference?). – Known from four countries in Europe (FISCHER 1974a: 21). New to the fauna of Mongolia. – Locality: 1 ♀ No. 926a.

Dinotrema macrocera (THOMSON, 1895) – Described from Sweden, reported from Austria (FISCHER 1973a: 251). New to the fauna of Mongolia. – Localities: 1 ♂ No. 504. 2 ♂ No. 926a. 1 ♂ No. 967.

Dinotrema (?)naevia (TOBIAS, 1962) – The Mongolian single female specimen differs in a few features from the redescription (FISCHER 1972: 417–419) as follows (in brackets the features given in the redescription): (1) antenna with 16 antennomeres and not damaged (antenna broken and with 17 antennomeres), (2) median flagellomeres one-third as long as broad (median flagellomeres two-thirds as long as broad), (3) upper short transverse keel short and strong (keel feebly distinct), (4) hind femur 4.4 times as long as broad (5 times as long as broad), (5) body 2.3 mm

long (body 2.5 mm long). Hitherto known only from Russia (Leningrad Region). – Locality: 1 ♀ No. 1107.

Dinotrema notaulica (FISCHER, 1974) ♂ new – Described and hitherto known only from Austria. New to the fauna of Mongolia. Male form new: Antenna with 22 antennomeres, first flagellomere 3.4 times, second flagellomere 2.6 times, further flagellomeres twice as long as broad. First tergite 1.8 times as long as broad behind. – Locality: 1 ♂ No. 926.

Dinotrema oleracea (TOBIAS, 1962) – Described from Russia (Sankt-Petersburg Region), reported from Austria (FISCHER 1973a: 252, 1973b: 127). New to the fauna of Mongolia. – Locality: 1 ♀ No. 973.

Dinotrema pembedum sp. n.: for description see p. 231.

Dinotrema propelamur sp. n.: for description see p. 232.

Dinotrema remotum sp. n.: for description see p. 234.

Dinotrema tosgonii sp. n.: for description see p. 236.

Dinotrema tuber sp. n.: for description see p. 238.

Dinotrema varipes (TOBIAS, 1962) – Described from the European part of Russia (Sankt-Petersburg Region). New to the fauna of Mongolia. – Locality: 1 ♀ No. 926a.

Pentapleura pumilio (NEES, 1814) – Locality: 1 ♂ No. 1091.

Phaenocarpa brevipalpis (THOMSON, 1895) – Known from Sweden so far. New to the fauna of Mongolia. – Locality: 1 ♂ No. 552.

Phaenocarpa conspurcator (HALIDAY, 1838) – First tergite slightly longer than wide behind, ovipositor sheath also slightly longer than hind tibia. Antenna with 23 (1 ♀) and 24 (2 ♀) flagellomeres, distal flagellomeres 2.6–2.3 times as long as broad. – Frequent to common in the Palaearctic Region; new to the fauna of Mongolia. – Localities: 1 ♀ No. 297/a. 1 ♂ No. 523. 1 ♂ No. 926. 1 ♀ No. 926/a. 2 ♀ No. 1123.

Phaenocarpa pullata (HALIDAY, 1838) – Reported from Mongolia by me (PAPP 1967: 212). – Localities: 2 ♂ No. 926/a. 1 ♂ No. 931.

Phaenocarpa ruficeps (NEES, 1812) – A Holarctic and frequent to common species. New to the fauna of Mongolia. – Localities: 1 ♂ No. 416. 1 ♀ No. 552. 1 ♂ No. 926. 1 ♀ No. 945. 1 ♀ No. 1032. 1 ♂ No. 1123. 1 ♂ No. 1150.

Synaldis concolor (NEES, 1812) – Frequent to common in the Palaearctic Region. First reported from Mongolia by me (PAPP 1967: 212). – Localities: 1 ♂ No. 926/a. 1 ♀ + 1 ♂ No. 938.

Synaldis distracta (NEES, 1834) – First reported from Mongolia by me (PAPP 1967: 212). – Locality: 1 ♂ No. 926/a.

Synaldis kaszabiana sp. n.: for description see p. 240.

Synaldis maxima FISCHER, 1962 – First reported from Mongolia by me (PAPP 1967: 213). KÖNIG (1972: 93) synonymized it with *S. concinna* (HALIDAY, 1838), FISCHER (1993/a: 568, 1993/b: 454), however, did not accept the synonymization.

DESCRIPTIONS OF THE NEW SPECIES

In this section nine new *Dinotema* and one new *Synaldis* species are described. In a superficial view the *Dinotrema* and *Synaldis* species are fairly similar to each other; to recognize their specific features or differences from their nearest allies is not an easy taxonomic task and requires some practice. The nine new *Dinotrema* species from Mongolia are differing in rather subtle features from their related species.

Abbreviations applied in the descriptions – Eyes: OOL = shortest distance between hind ocellus and compound eye, POL = shortest distance between hind two ocelli. Wing venation (cf. VAN ACHTERBERG 1979: 248–249): *m-cu* = recurrent vein, *r* = first section of the radial vein, *Cu1a*

= parallel or second section of the discoidal vein, *CU1b* = second section of the outer vein of sub-basal cell, *1-CU(1)*, *2-CU(1)* and *3-CU(1)* = first, second and third sections of the discoidal vein, *2-M* = third section of the cubital vein, *2-SR* = first transverse cubital vein, *3-SR* and *4-SR* = second and third sections of the radial vein.

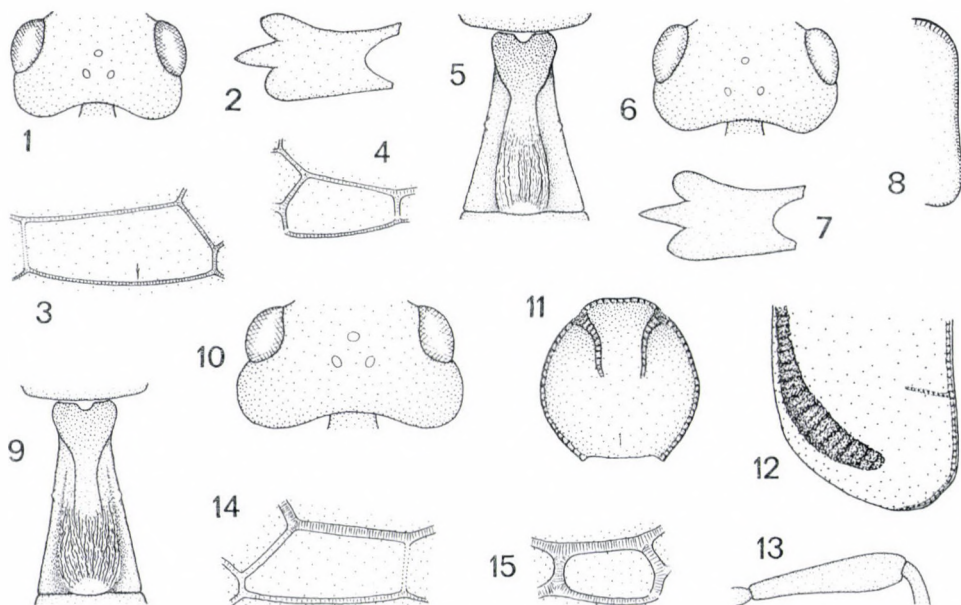
***Dinotrema amoepilosum* sp. n. ♀**
(Figs 1–5)

Material examined (1 ♀). – Female holotype: Mongolia, Central aimak, Ulan-Baator, Zaisan im Bogdo ul, 1600 m, 6 June 1966, leg. KASZAB (No. 499); swept in a valley with spring vegetation.

Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. No. 7806.

Etymology. – The species name is a combination of two words, the first word (*amoe*) indicates its nearest ally, *D. amoenidens*, the second word (*pilosus*) refers to the evenly hairy mesonotum.

Description of the female holotype. – Body 2 mm long. Antenna as long as body and with 19 antennomeres. First flagellomere 2.4 times, second flagellomere twice as long as broad, further flagellomeres indistinctly attenuating so that flagellomeres 3–15 slightly shortening and penultimate flagellomere 1.6 times as long as broad. – Head in dorsal view (Fig. 1) somewhat less transverse, 1.7 times as broad as long, eye a bit longer than temple, temple rounded, occiput excavated.



Figs 1–15. *Dinotrema amoepilosum* sp. n.: 1 = head in dorsal view, 2 = mandible, 3 = second submarginal cell, 4 = first subbasal cell, 5 = first tergite. – *D. brevimeres* sp. n.: 6 = head in dorsal view, 7 = mandible, 8 = hind crenulate margin of mesopleuron, 9 = first tergite. – *D. flaviantenna* sp. n.: 10 = head in dorsal view, 11 = mesonotum, 12 = ventral half of mesopleuron with precoxal suture, 13 = hind femur, 14 = second submarginal cell, 15 = first subbasal cell

Ocelli small and less elliptic, OOL about 2.5 times as long as POL. Eye in lateral view 1.7 times as high as wide and as wide as temple, latter somewhat narrowing ventrally. Mandible (Fig. 2) 1.37 times as long medially as high between teeth 1 and 3, broadening distally, tooth 1 less rounded than tooth 3. Tentorial pits small, as long as its distance from eye, i.e. clearly not reaching eye. Face twice as wide as high, hairy. Head polished.

Mesosoma stout, minutely longer than high. Notaulix on anterior declivous part of mesonotum hardly distinct. Mesonotal dimple linear. Precoxal suture short, narrow, crenulate. Propodeon rugo-rugulose, both medio-longitudinal and transverse keels present, latter laterally less distinct. Mesonotum entirely and evenly hairy, together with scutellum and mesopleuron polished. – Hind femur four times as long as broad distally. Hind basitarsus as long as tarsomeres 2–3 and half of fourth tarsomere combined.

Fore wing one-fourth longer than body. Second submarginal cell wide, 2–*M* concavely bent (Fig. 3, see arrow), 3–*SR* 2.7 times as long as 2–*SR*, 4–*SR* faintly S-form and twice as long as 3–*SR*. First subdiscal (or brachial) cell widening distally, 1–2–*CU*(1) twice as long as 3–*CU*(1) and *CU*-1*b* combined (Fig. 4); 1–2–*CU*(1) 2.5 times as long as *m-cu*, *cula* stub-like (Fig. 4).

Metasoma somewhat longer than mesosoma but shorter than head + mesosoma combined. First tergite (Fig. 5) 1.5 times as long as wide behind, evenly broadening posteriorly, pair of spiracles at middle of tergite, pair of keels reaching hind end of tergite, tergite between keels with longitudinal rugulae. Further tergites polished. Ovipositor sheath curved upwards and slightly longer than first tergite.

Body dark brown, tegulae and legs brownish yellow. Scape and pedicel brownish yellow, flagellum darkening brown. Mandible brownish, palpi pale yellow. Wings hyaline, pterostigma and veins opaque brownish-yellowish.

Male and host unknown.

Distribution: Mongolia.

With the help of FISCHER's key (1976) the new species, *Dinotrema amoepilosum* sp. n., runs to *D. amoenidens* (FISCHER, 1973) (Austria, China), the two species are similar to each other, however, differing in a few specific features:

- 1 (2) Disc of mesonotum hairy along notaulix, otherwise bald. First tergite less broadening posteriorly, 1.7 times as long as broad behind. 3–*SR* 2.4 times as long as 2–*SR*; second submarginal cell less wide, 2–*M* straight. Head in dorsal view transverse, 1.85 times as broad as long. ♀ 1.8 mm

D. amoenidens (FISCHER)

- 2 (1) Disc of mesonotum entirely and evenly hairy. First tergite more broadening posteriorly, 1.5 times as long as broad behind (Fig. 5). 3–*SR* 2.7 times as long as 2–*SR*; second submarginal cell wide, 2–*M* concavely bent (Fig. 3, see arrow). Head in dorsal view somewhat less transverse, 1.7 times as broad as long (Fig. 1). ♀ 2 mm

***D. amoepilosum* sp. n.**

***Dinotrema brevimeres* sp. n. ♀**
(Figs 6–9)

Material examined (1 ♀). – Female holotype: Mongolia, Chövsgöl aimak, Alag Mort, 42 NO vom Paß Chaldzan Sogotyn davaa, am Fluß Tesijn gol, 1900 m, 14 July 1968, leg. KASZAB (No. 1107); swept in a pine-wood and at the edge of the wood with luxuriant vegetation.

Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. No. 7807.

Etymology. – The species name “*brevimeres*” refers to the short flagellomeres.

Description of the female holotype. – Body 2 mm long. Antenna somewhat shorter than body and with 16 antennomeres. First flagellomere three times, second flagellomere 2.2 times, further flagellomeres shortening so that 1.4 to 1.2 times as long as broad. – Head in dorsal view (Fig. 6) somewhat transverse, 1.78 times as broad as long, eye as long as temple, temple rounded, occiput excavate. Ocelli small and almost round, OOL 2.3 times as long as POL. Eye in lateral view 1.5 times as high as wide, a bit wider than temple, latter evenly broad beyond eye. Mandible (Fig. 7) 1.5 times as long medially as high between teeth 1 and 3, broadening distally; tooth 2 spiky, teeth 1 and 3 rounded. Tentorial pit short, shorter than its distance from eye, i.e. not reaching eye. Shortest width of face 1.6 times as wide as high medially. Head polished, face hairy.

Mesosoma in lateral view stout, 1.16 times as long as high. Notaulix short and distinct on fore declivous part of mesosoma. Mesonotal dimple guttiform. Propodeon densely rugulose with a few rugae, without keels. Precoxal furrow reaching fore margin of mesopleuron and not reaching coxa, finely crenulate; hind margin of mesopleuron finely crenulate (Fig. 8). Mesonotum, scutellum and mesopleuron polished. – Hind femur 4.4 times as long as broad distally. Hind basitarsus as long as tarsomeres 2–3 combined.

Fore wing one-fourth longer than body. Second submarginal cell of usual length, 3–SR 2.1 times as long as 2–SR, 4–SR S-form and 2.3 times as long as 3–SR; 1–2CU(1) 1.9 times as long as *m-cu*.

Metasoma as long as mesosoma. First tergite (Fig. 9) 1.85 times as long as broad behind, evenly broadening posteriorly, pair of spiracles at middle of tergite, pair of keels merging posteriorly into longitudinal rugulosity. Further tergites polished. Ovipositor sheath 1.6 times as long as first tergite or as long as hind tarsomeres 1–3.

Head and mesosoma black, metasoma blackish brown. Scape, pedicel and base of first flagellomere brown, flagellum dark brown. Second tergite feebly rusty. Mandible brownish yellow, palpi pale yellow. Legs brownish yellow. Wings hyaline, pterostigma and veins brownish-yellowish.

Male and host unknown.

Distribution: Mongolia.

The new species, *Dinotrema brevimeres* sp. n., runs to *D. amoenidens* (FISCHER, 1973) (Austria, China) with the help of FISCHER's key (1976), the two species are very similar to each other and they are distinguished by the features:

- 1 (2) Propodeon with a complete medio-longitudinal as well as a transverse bent keels, hind pair of areolae divided by a faint longitudinal keel each, areolae rugulose-subrugulose, shiny. Antenna with 18 antennomeres, flagellomeres 5–15 1.6 times as long as broad. First tergite 1.7 times as long as broad behind. ♀ 1.8 mm

D. amoenidens (FISCHER)

- 2 (1) Propodeon evenly rugose and without keels. Antenna with 16 antennomeres, flagellomeres 5–13 1.3–1.2 times as long as broad. First tergite 1.85 times as long as broad behind (Fig. 9). ♀ 2 mm **D. brevimeres** sp. n.

***Dinotrema flaviantenna* sp. n. ♀**

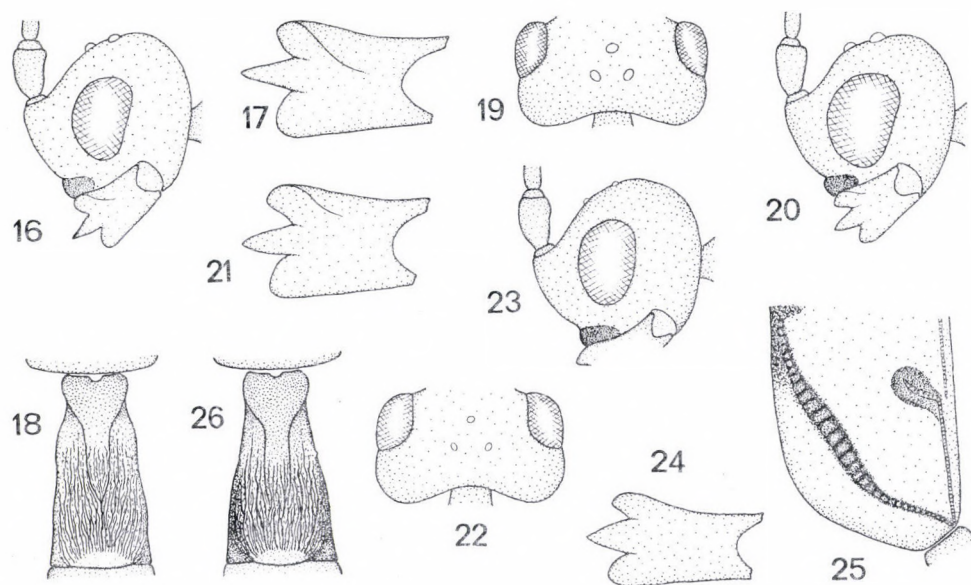
(Figs 10–18)

Material examined (1 ♀). – Female holotype: Mongolia, Central aimak, Ulan Baator, Nucht im Bogdo ul, 1600–1700 m, 22 July – 27 August 1965, leg. KASZAB (No. 297b); taken with pitfall trap in forest.

Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. No. 7808.

Etymology. – The species name “flaviantenna” refers to the yellow coloured antenna.

Description of the female holotype. – Body 2.5 mm long. Antenna as long as body and with 20 antennomeres. First flagellomere 3.6 times and penultimate flagellomere 1.6 times as long as broad, flagellomeres distinctly separated. – Head in dorsal view (Fig. 10) transverse, 1.87 times as broad as long, temples somewhat bulging, i.e. head between temples somewhat broader than between eyes; temple somewhat longer than eye. Ocelli small and elliptic, OOL twice as long as POL. Frons without median dimple. Eye in lateral view (Fig. 16) 1.57 times as high as wide, temple



Figs 16–26. *Dinotrema flaviantenna* sp. n.: 16 = head in lateral view, 17 = mandible, 18 = first tergite. – *D. notaulica* (FISCHER): 19 = head in dorsal view, 20 = head in lateral view, 21 = mandible. – *D. kaszabi* sp. n.: 22 = head in dorsal view, 23 = head in lateral view, 24 = mandible, 25 = ventral half of mesopleuron with precoxal suture, 26 = first tergite

somewhat wider than eye. Mandible (Fig. 17) 1.3 times as long medially as wide between teeth 1 and 3, moderately broadening distally, tooth 2 pointed, teeth 1 and 3 rounded. Tentorial pit clearly not reaching eye. Face twice as wide as high. Head polished, face and clypeus with disperse hairs.

Mesosoma in lateral view 1.3 times as long as high. Notaulix extending to fore half of mesonotum, i.e. running from its fore margin to its middle, crenulate (Fig. 11). Mesonotal dimple indistinct. Precoxal suture complete, wide and continuing along fore margin of mesopleuron, rugose (Fig. 12). Mesonotum and scutellum polished, propodeon and metapleuron rugose, former without areolae. – Hind femur 4.4 times as long as broad distally, smooth (Fig. 13). Hind basitarsus as long as tarsomeres 2–3 and half of fourth tarsomere.

Fore wing as long as body. Second submarginal cell short, $3-SR$ 1.66 times as long $2-SR$, $4-SR$ 3.5 times as long as $3-SR$ and reaching tip of wing (Fig. 14). First subdiscal (or brachial) cell short, $2-CU(1)$ somewhat longer than $3-CU(1) + CU1b$ combined; $CU1a$ missing (Fig. 15). Veins r , $3-4-SR$ and $1-2CU(1)$ thick (Figs 14–15).

Metasoma somewhat shorter than head + mesosoma combined. First tergite twice as long as broad behind, subparallel-sided or indistinctly broadening posteriorly, pair of spiracles before middle of tergite, pair of converging basal keels meeting before middle of tergite and continuing in a median keel as far as hind margin, tergite longitudinally uneven-rugulose (Fig. 18). Further tergites polished. Ovipositor sheath bent and as long as hind basitarsus.

Antenna brownish yellow. Head black with faint rusty tint on face beneath antennal socket and on temple. Mesosoma and first tergite black. Tergites 2–3 brown, further tergites dark brown. Mandible brown, palpi pale yellow. Tegula yellow. Legs brownish yellow, coxae and trochanters yellow. Wings subfamous, pterostigma and veins opaque brown.

Male and host unknown.

Distribution: Mongolia.

The new species, *Dinotrema flaviantenna* sp. n., is related to *D. notaulica* (FISCHER, 1974) (Austria), the two species are distinguished by the following features:

- 1 (2) Temple in dorsal view (Fig. 10) bulging, i.e. head between temples somewhat broader than between eyes; eye in lateral view (Fig. 16) somewhat less wide than temple. Median tooth of mandible projecting (Fig. 17). Antenna brownish yellow, first tergite black. ♀ 2.5 mm ***D. flaviantenna* sp. n.**
- 2 (1) Temple in dorsal view (Fig. 19) not bulging, i.e. head between temples as broad as between eyes; eye in lateral view (Fig. 20) somewhat wider than temple. Median tooth of mandible less projecting (Fig. 21). Scape, pedicel and base of first flagellomere brownish yellow, flagellum brownish black, first tergite rufous. ♀ 1.5 m, ♂ 2 mm ***D. notaulica* (FISCHER)**

***Dinotrema kaszabi* sp. n. ♀**
(Figs 22–26)

Material examined (1 ♀). – Female holotype: Mongolia, Archangaj aimak: Changaj Gebirge, 9 km NO vom Pa Egijn davaa, 2500 m, 19 July 1966, leg. KASZAB (No. 714); swept along a brook with humid and luxuriant vegetation.

Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. No. 7809.

Etymology. – The new species is dedicated to Dr. Z. KASZAB (1915–1986), former general director of the Hungarian Natural History Museum, the collector of the new species. He contributed with his six zoological collecting trips to Mongolia (in the years 1963–1968) significantly to the foundation of our knowledge of the insect fauna of this country.

Description of the female holotype. – Body 2.4 mm long. Antenna short, about as long as head, mesosoma and first tergite combined and with 15 antennomeres. First flagellomere three times, second flagellomere twice and further flagellomeres 1.3 times as long as broad. – Head in dorsal view (Fig. 22) 1.67 times as broad as long, head between temples a bit broader than between eyes, eye a bit longer than temple, temple rounded, occiput excavated. Ocelli small, elliptic, far from each other, OOL one-third longer than POL. Eye in lateral view (Fig. 23) almost twice as high as wide, temple one-fourth wider than eye. Mandible (Fig. 24) 1.6 times as long medially as broad between teeth 1 and 3, feebly broadening distally; tooth 2 spiky, tooth 1 less spiky and tooth 3 rounded. Tentorial pit not reaching inner margin of eye. Shortest width of face (close below antennal socket) 1.8 times as wide as high medially, inner margin somewhat diverging ventrally. Head polished, face and clypeus with hairs somewhat denser than usually.

Mesosoma in lateral view 1.2 times as long as high. Mesonotal dimple short and deep, close before prescutellar furrow. Precoxal suture long, reaching anterior margin of mesopleuron and middle coxa, wide and crenulate (Fig. 25). Hind margin of mesopleuron with very fine crenulation (Fig. 25). Middle lobe of mesonotum entirely hairy. Propodeon evenly rugose with neither areola nor longitudinal or transverse keel. – Hind femur four times as long as broad distally. Hind basitarsus as long as tarsomeres 2–4 combined.

Fore wing somewhat longer than body. Pterostigma narrowing distally, basally half as wide as length of *r*, 3-SR 2.1 times as long as 2-SR, 4-SR 2.4 times as long as 3-SR and indistinctly S-form. *Cu1-a* issuing from posterior part of outer vein, i.e. 3-Cu(1) + *Cu1b* combined, of subdiscal (or brachial) cell.

Metasoma somewhat longer than head and mesosoma combined. First tergite (Fig. 26) 1.75 times as long as broad behind, evenly broadening posteriorly, pair of spiracles close before middle of tergite, pair of basal keels merging posteriorly into longitudinal striation, shiny. Further tergites polished. Ovipositor sheath as long as hind tarsomeres 1–3 or nearly twice as long as first tergite.

Head brownish black, mesosoma and first tergite black, sternites 1–2 with yellowish pattern. Scape and pedicel yellowish brown, flagellum dark brown. Mandible yellow, palpi and oral organs pale yellow. Legs brownish yellow, hind coxa basally darkening. Wings hyaline, pterostigma and veins brown.

Male and host unknown.

Distribution: Mongolia.

The new species, *Dinotrema kaszabi* sp. n., runs to *D. microcera* (THOMSON, 1895) within the species-group *signifrons-petiolata* (FISCHER 1976: 349–352), the two species are separated with the features keyed:

- 1 (2) Propodeon with a fairly narrow, pentagonal areola as well as a basal keel and lateral costulae, areolae uneven to subrugulose, shiny. Precoxal suture narrow, finely crenulate and reaching only fore margin of mesopleuron. First tergite twice as long as broad behind. Fore half of mesonotum sparsely hairy. Flagellomeres 5–13 about 1.5 times as long as broad. ♀ 1.3 mm

D. microcera (THOMSON)

- 2 (1) Propodeon evenly rugose and without areola. Precoxal suture long, wide, crenulate and reaching fore margin of mesopleuron as well as middle coxa (Fig. 25). First tergite 1.75 times as long as broad behind (Fig. 26). Middle lobe of mesonotum entirely hairy. Flagellomeres 5–12 1.3 times as long as broad. ♀ 2.4 mm

D. kaszabi sp. n.

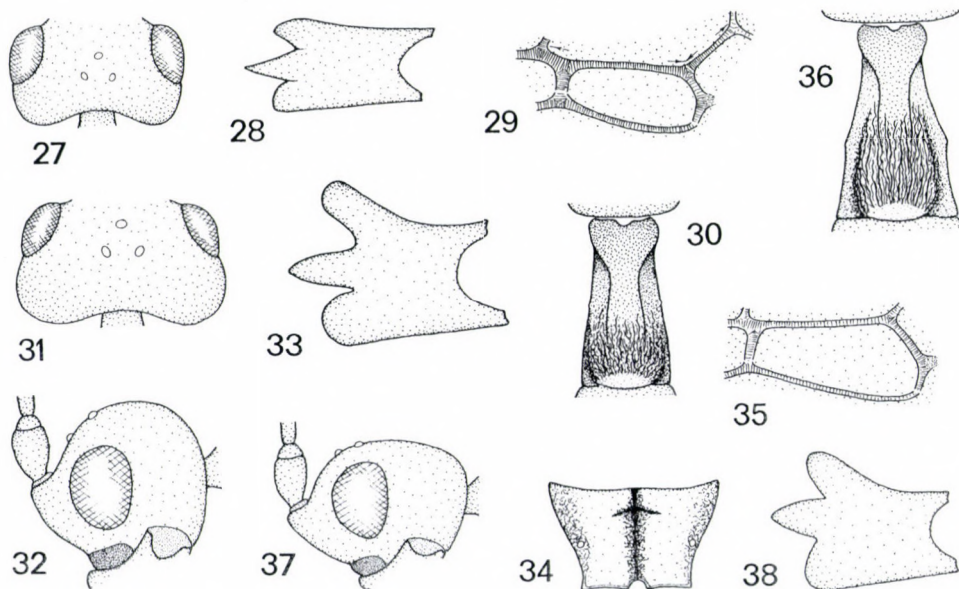
Dinotrema pembum sp. n. ♀
(Figs 27–30)

Material examined (1 ♀). – Female holotype: Mongolia, Central aimak, 11 km OSO von Somon Bajanzogt, 1600 m, 13 June–26 July 1968, leg. KASZAB (No. 945); taken with pitfall in birch forest.

Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. No. 7810.

Etymology. – The species name “pembum” is a phantasy name.

Description of the female holotype. – Body 1.9 mm long. Antenna short, about as long as head, mesosoma and first tergite combined and with 16 antennomeres. First flagellomere three times, second flagellomere clearly twice, flagellomeres 3–8 1.8 times as long as broad, further flagellomeres indistinctly attenuating so that penultimate flagellomere twice as long as broad. – Head in dorsal view (Fig. 27) transverse, 1.7 times as broad as long, eye as long as temple, latter



Figs 27–38. *Dinotrema pembum* sp. n.: 27 = head in dorsal view, 28 = mandible, 29 = first subbasal cell with vein *m-cu*, 30 = first tergite. – *D. propelamur* sp. n.: 31 = head in dorsal view, 32 = head in lateral view, 33 = mandible, 34 = propodeon, 35 = subbasal cell, 36 = first tergite. – *D. parapunctata* (FISCHER): 37 = head in lateral view, 38 = mandible

rounded, occiput excavated. Ocelli small and less elliptic, OOL three times as long as POL. Eye in lateral view 1.6 times as high as wide, temple beyond eye 1.25 times as broad as eye, ventrally indistinctly narrowing. Mandible (Fig. 28) 1.66 times as long as broad between teeth 1 and 3, hardly broadening distally, tooth 2 spiky, tooth 1 less spiky, tooth 3 rounded. Tentorial pit less small, somewhat longer than its distance from eye, i.e. not reaching eye. Face 1.5 times as wide as high, hairy. Head polished.

Mesosoma in lateral view 1.25 times as long as high. Notaulix restricted to fore declivous part of mesonotum. Mesonotal dimple linear. Precoxal suture wide and crenulate, indistinctly reaching middle coxa. Propodeon rugose, without keels. Mesonotum, scutellum and mesopleuron polished. – Hind femur 4.5 times as long as broad posteriorly. Hind basitarsus as long as tarsomeres 2–3 and half of tarsomere 4.

Fore wing distinctly one-fourth longer than body. Vein 3–SR 2.3 times as long as 2–SR, 4–SR faintly bent and 2.28 times as long as 3–SR. 1–2CU(1) 2.25 times as long as *m-cu*, *cula* stub-form (Fig. 29, see arrows).

Metasoma as long as head and mesosoma combined. First tergite (Fig. 30) 1.86 times as long as broad behind, less though evenly broadening posteriorly, pair of spiracles at middle of tergite, pair of keels merging posteriorly into longitudinal rugosity. Further tergites polished. Ovipositor sheath 1.5 times as long as first tergite or as long as hind tarsomeres 1–2 combined.

Antenna brown, body dark brown, legs yellow. Mandible brownish yellow, palpi and tegulae yellow. Wings hyaline, pterostigma and veins brownish yellowish.

Male and host unknown.

Distribution: Mongolia.

The new species, *Dinotrema pembum* sp. n., is related to *D. ovalisignum* (FISCHER, 1974) (Austria) considering their long and crenulate precoxal suture, subcrenulate hind margin of mesopleuron and long mandible; the two species are distinguished by the features keyed:

- 1 (2) Propodeon with distinct medio-longitudinal and anteriorly with transverse keels, medio-posteriorly with an oval areola, surface of propodeon smooth to partly uneven, shiny (Fig. 14 in FISCHER 1974: 11). Mandible distinctly broadening distally and 1.5 times as long as broad between teeth 1 and 3. First tergite twice as long as broad. Antenna with 18 antennomeres. Body black. ♀ 1.9 mm *D. ovalisignum* (FISCHER)
- 2 (1) Propodeon rugose, without keels and areola. Mandible hardly broadening distally and 1.6 times as long as broad between teeth 1 and 3 (Fig. 28). First tergite 1.8 times as long as broad behind (Fig. 30). Antenna with 16 antennomeres. Body brown. ♀ 1.9 mm ***D. pembum* sp. n.**

***Dinotrema propelamur* sp. n. ♀**
(Figs 31–36)

Material examined (2 ♀). – Female holotype + one female paratype: Mongolia, Chövsgöl aimak, 3 km SW von Somon Burenchaan, 1650 m, 21 June–16 July 1968, leg. KASZAB (No. 993); taken with pitfall trap near a brook in a stony and desolate valley.

Holotype and one paratype are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7811 (holotype) and 7812 (paratype).

Etymology. – The species name “propelamur” indicates the taxonomically nearest species *D. latifemur* in an abbreviated form: propela[tif]mur.

Description of the female holotype – Body 2.1 mm long. Antenna short, about as long as head, mesosoma and first tergite combined and with 16 antennomeres. First flagellomere 2.7 times, second flagellomere 2.2 times and flagellomeres 3–15 1.3 times as long as broad. – Head in dorsal view (Fig. 31) transverse, 1.74 times as broad as long, head between temples somewhat broader than between eyes, i.e. temple somewhat bulging, eye somewhat shorter than temple. Head 1.5 times as broad as mesosoma between tegulae. Ocelli small, elliptic and fairly far from each other, OOL clearly twice as long as POL. Eye in lateral view (Fig. 32) 1.4 times as high as wide, temple 1.2–1.3 times as wide as eye. Mandible (Fig. 33) fairly large, medially as long as broad between teeth 1 and 3; tooth 2 spiky and only somewhat longer than tooth 1, teeth 1 and 3 rounded. Tentorial pit not reaching eye. Shortest width of face (close below antennal socket) 1.6 times as wide as its height medially, inner margin of eyes somewhat diverging ventrally. Head polished.

Mesosoma in lateral view 1.3 times as long as high. Mesonotal dimple linear, deep. Precoxal suture short, restricted to middle of mesopleuron, narrow and crenulate. Hind margin of mesopleuron finely punctate. Propodeon (Fig. 34) along a weak medio-longitudinal carina rugulose, anteriorly crossing a short transverse carina, anteriorly from transverse carina the medio-longitudinal carina strong, beyond it less strong; lateral pair of spiracles small, lateral margin of propodeon rugulose. – Hind femur 3.3 times as long as broad medially.

Fore wing about as long as body. Vein 3–SR distinctly twice as long as 2–SR and 4–SR almost three times as long as 3–SR. Subdiscal cell issuing *CU1a* posteriorly from 3–*CU(1)* + *CU1b* (Fig. 35).

Metasoma somewhat shorter than head and mesosoma combined. First tergite (Fig. 36) 1.6 times as long as broad behind, pair of spiracles beyond middle of tergite and beyond spiracles tergite less broadening, longitudinally subrugulose-uneven. Further tergites polished. Ovipositor sheath as long as hind tarsomeres 2–5 combined.

Head and mesosoma dark brown, fore half of metasoma light brown, hind half brown. Scape and pedicel brown, flagellum greyish dark brown. Mandible brown, palpi pale. Tegula brown. Legs light brown, fore coxa darkening brownish. Wings hyaline, pterostigma brownish, veins yellowish-brownish.

Description of the female paratype (1 ♀). – Similar to the holotype. Vein 3–SR 2.5 times as long as 2–SR. Mesosoma dark brown with rusty pattern, metasoma rather brown. Coxae and trochanters brownish yellow, rest of legs light brown.

Male and host unknown.

Distribution: Mongolia.

Within the *subcubicus* species-group of the genus *Dinotrema* the new species, *Dinotrema propelamur* sp. n., is nearest to *D. latifemur* (FISCHER, 1974) (Germany, Austria) (see FISCHER's key 1976: 346–348), the two species are differentiated by the features keyed:

- 1 (2) Head in dorsal view between temples as broad as between eyes, i.e. temple not bulging beyond eye. Antenna of female with 20 antennomeres, flagellomeres twice as long as broad. Precoxal suture long, reaching near to fore margin of mesopleuron. First tergite twice as long as broad behind. Mandible long, 1.5 times as long as broad between teeth 1 and 3. Flagellum brown. ♀ 2 mm

D. latifemur (FISCHER)

- 2 (1) Head in dorsal view (Fig. 31) between temples somewhat broader than between eyes, i.e. temple somewhat bulging beyond eye. Antenna of female with 16 antennomeres, flagellomeres 1.3 times as long as broad. Precoxal suture short, ending far before fore margin of mesopleuron. First tergite 1.6 times as long as broad behind (Fig. 36). Mandible broad, as long medially as broad between teeth 1 and 3 (Fig. 33). Flagellum blackish brown. ♀ 2–2.1 mm
D. propelamur sp. n.

The new species is also near to *D. parapunctata* (FISCHER, 1976) (Austria) within the *subcubicus* species-group considering their less transverse head, similar venation of fore wing (second submarginal cell!) and similar form of first tergite; the two species are clearly differentiated by the following features keyed:

- 1 (2) Head in lateral view somewhat compressed dorso-ventrally, temple 1.3–1.4 times as wide as eye or head somewhat longer than high (Fig. 37). Flagellomeres 3–15 1.6–1.8 times as long as broad. Mandible usual in size, somewhat less broad between teeth 1 and 3 than width of eye (Fig. 38). Fore wing: *Cu1a* issuing from middle of subdiscal cell. ♀ 1.5–1.8 mm

D. parapunctata (FISCHER)

- 2 (1) Head in lateral view not compressed dorso-ventrally, i.e. usual in form, temple 1.2–1.3 times as wide as eye or head about as long as high (Fig. 32). Flagellomeres 3–15 1.3 times as long as broad. Mandible fairly large, as broad between teeth 1 and 3 as width of eye (Fig. 33). Fore wing: *Cu1a* issuing posteriorly from middle of subdiscal cell (Fig. 35). ♀ 2–2.1 mm

D. propelamur sp. n.

Dinotrema remotum sp. n. ♀♂
(Figs 39–44)

Material examined (2 ♀ + 3 ♂). – Female holotype: Mongolia, Central aimak, Tosgoni ovoo, 10 km N von Ulan-Baator, 1700–1900 m, 23–24 July 1967, leg. KASZAB (No. 926); swept in birch forest. – Paratypes (1 ♀ + 2 ♂): 1 ♀ + 2 ♂ Mongolia, Bulgan aimak, Namnan ul Gebirge, 23 km NW von Somon Chutag, 1150 m, 21 July 1968, leg. KASZAB (No. 1136); singled. – 1 ♂ Mongolia, Chövsgöl aimak, zwischen Somon Cecerleg und Somon Bajan-ul, 65 km W von Cecerleg, 1700 m, 22 June 1968, leg. KASZAB (No. 1002); swept in a mountain steppe area with herbs and *Caragana*.

Holotype and four paratypes are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7813 (holotype) and 7814–7817 (paratypes).

Etymology. – The species name “remotum” indicates the very long geographic distance between the type localities of the two species *D. remotum* and *D. venustum*.

Description of the female holotype. – Body 2.2 mm long. Antenna about as long as body and with 21 antennomeres. First flagellomere three times, second flagellomere twice, further flagellomeres 1.5 times as long as broad. – Head in dorsal view (Fig. 39) 1.8 times as broad as long and

1.3 times as broad as mesosoma between tegulae; eye one-third longer than temple, temple more rounded, occiput excavated. Ocelli nearly round, OOL nearly three times as long as POL. Eye in lateral view 1.7 times as high as wide and somewhat wider than temple. Mandible (Fig. 40) long and less broadening distally, 1.6 times as long medially as broad between teeth 1 and 3, tooth 2 spiky, tooth 1 less spiky and shorter than tooth 2 (see arrow in Fig. 40), tooth 3 rounded. Tentorial pit clearly not reaching eye. Face about 1.5 times as wide as high.

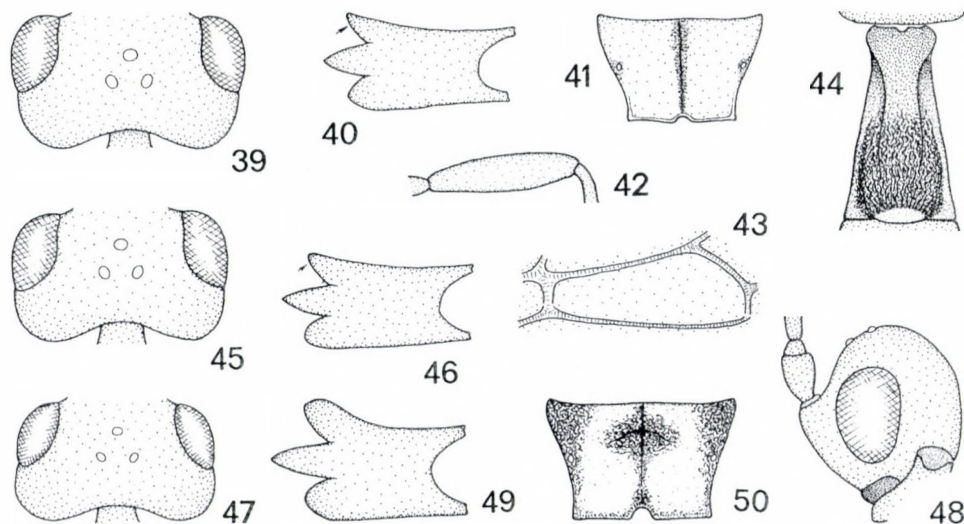
Mesosoma in lateral view 1.25 times as long as high. Mesonotal dimple linear, less deep. Precoxal suture narrow, subcrenulate, reaching neither anterior nor posterior margins of mesopleuron. Hind margin of mesopleuron smooth. Propodeon smooth and shiny and with a medio-logitudinal carina, along carina with rather transverse rugae-rugulae, spiracle small and close around it subrugulose (Fig. 41). – Hind femur 4.2 times as long as broad distally (Fig. 42). Hind basitarsus as long as tarsomeres 2–3 combined.

Fore wing somewhat longer than body. Vein 3–SR 2.5 times as long as 2–SR and 4–SR twice as long as 3–SR. Subdiscal cell widening distally and issuing stub-like *CULa* from posterior part of its outer veins 3–*CUL* + *CULb* (Fig. 43).

Metasoma about as long as head and mesosoma combined. First tergite (Fig. 44) 1.7 times as long as broad behind, evenly broadening posteriorly, pair of keels extending to its hind half, pair of spiracles at middle of tergite, rugo-rugulose. Further tergites polished. Ovipositor sheath as long as hind tarsomeres 1–3 combined or somewhat longer than first tergite.

Ground colour of body dark brown. Scape and pedicel yellow, flagellum brown to dark brown. Mandible yellow, palpi pale yellow. Tegulae and legs yellow. First tergite rusty brown. Wings hyaline, pterostigma brownish, veins light brownish.

Description of the female paratype (1 ♀). – Similar to the female holotype. Body 2.2 mm long. Antenna with 20 antennomeres. Head in dorsal view 1.77 times as broad as long. First tergite 1.8 times as long as broad behind. Scape and pedicel brown, propodeon rusty brown.



Figs 39–50. *Dinotrema remotum* sp. n.: 39 = head in dorsal view, 40 = mandible, 41 = propodeon, 42 = hind femur, 43 = subbasal cell, 44 = first tergite. – *D. venusta* (TOBIAS): 45 = head in dorsal view, 46 = mandible. – *D. tosgonii* sp. n.: 47 = head in dorsal view, 48 = head in lateral view, 49 = mandible, 50 = propodeon

Description of the male paratypes (3 ♂). – Similar to the female. Body 2.1–2.2 mm long. Antenna somewhat longer than body and with 24–25 antennomeres. Flagellomeres 3–24–25 twice as long as broad. Head in dorsal view 1.75–1.8 times as broad as long. First tergite 1.8–1.9 times as long as broad behind; one male: first tergite uneven to smooth.

Host unknown.

Distribution: Mongolia.

Within the *subcubicus* species-group of the genus *Dinotrema* (see FISCHER 1976: 346–348) the new species, *Dinotrema remotum* sp. n., is allied to *D. venustum* (TOBIAS, 1962) (?=*D. glabra* STELFOX et GRAHAM, 1951, junior name) (European part of Russia, Austria) considering their long mandible and long eye in dorsal view, the two species are distinguished by the following features:

1 (2) Flagellomeres 3–20–21 (♀) and 3–24–25 (♂) at most 1.5–1.6 times and twice as long as broad, respectively. Temple in dorsal view more rounded or just receded (Fig. 39). Tooth 1 of mandible shorter than tooth 2, former somewhat spiky (Fig. 40, see arrow). First tergite rusty brown. ♀ 2.2 mm, ♂ 2.1–2.2 mm
***D. remotum* sp. n.**

2 (1) Flagellomeres 3–19–22 (♀) and 3–21–26 (♂) clearly twice and 2.3–2.4 times as long as broad, respectively. Temple in dorsal view rounded (Fig. 45). Tooth 1 of mandible about as long as tooth 2, former somewhat less spiky (Fig. 46, see arrow). First tergite reddish yellow. ♀♂ 1.7–2.1 mm
***D. venustum* (TOBIAS)**

***Dinotrema tosgonii* sp. n. ♀** (Figs 47–52)

Material examined (2 ♀). – Female holotype: Mongolia, Central aimak, Tosgoni ovoo, 10 km N von Ulan-Baator, 1700–1900 m, 23–24 July 1967, leg. KASZAB (No. 926/a); swept at the edge of a wood and in a high mountain steppe meadow. – One female paratype: Mongolia, Chövsgöl aimak, Alag Mort, 42 km NO vom Pa Chaldzan Sogotyn davaa, am Flu Tesijn gol, 1900 m, 14 July 1968, leg. KASZAB (No. 1107); swept in a pine-wood and edge of the wood with luxuriant vegetation.

Holotype and one paratype are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7818 (holotype) and 7819 (paratype).

Etymology. – The species name “*tosgonii*” refers to the name of the type locality in Mongolia, in the wide environment of the capital Ulan-Baator.

Description of the female holotype. – Body 2.1 mm long. Antenna somewhat shorter than body and with 19 antennomeres. First flagellomere 2.4 times, further flagellomeres twice as long as broad. – Head in dorsal view (Fig. 47) transverse, 1.7 times as broad as long, eye as long as temple. Head 1.3 times as broad as mesonotum between tegulae. Ocelli small and elliptic, OOL more than twice as long as POL. Eye in lateral view (Fig. 48) 1.6 times as high as wide and as wide as temple. Mandible (Fig. 49) 1.2 times as long as broad between teeth 1 and 3, tooth 2 spiky, tooth 1 less

spiky, tooth 3 rounded. Tentorial pit not reaching inner margin of eye. Shortest width of face 1.7 times as wide as its median height, inner margin of eyes subparallel. Head polished.

Mesosoma in lateral view 1.2 times as long as high. Mesonotal dimple linear and deep. Pre-coxal suture short, subcrenulate. Hind margin of mesopleuron finely crenulate. Propodeon (Fig. 50) along medio-longitudinal keel rugulose, above with a short transverse keel, laterally also rugo-rugulose, otherwise propodeon polished, pair of spiracles small. – Hind femur four times as long as broad distally.

Fore wing somewhat longer than body. Vein 3-SR three times as long as 2-SR, 4-SR 2.2–2.4 times as long as 3-SR. Subbasal cell issuing *CU1a* from middle of vein 3-CU(1)+*CU1b*, latter veins somewhat thick (Fig 51).

Metasoma somewhat shorter than head + mesosoma combined. First tergite (Fig. 52) 1.6 times as long as broad behind, pair of spiracles at middle of tergite, from base to spiracles broadening as usually, beyond spiracles subparallel-sided, striate-rugulose. Further tergites polished. Ovipositor sheath as long as tarsomeres 1–3 combined.

Head and mesosoma blackish brown, metasoma dark brown. Scape and pedicel yellowish brown, flagellum dark brown. Brownish yellow: mandible, palpi, tegulae and legs. Wings hyaline, pterostigma brownish, veins light brownish.

Description of the female paratype (1 ♀). – Similar to the female holotype. Body 2.1 mm long. Vein 4-SR 2.4 times as long as 3-SR. First tergite 1.7 times as long as broad behind. Body with lighter colour: head blackish brown, mesosoma dark brown, metasoma brown, coxae-trochanters yellow.

Male and host unknown.

Distribution: Mongolia.

The new species, *Dinotrema tosgonii* sp. n., runs to *D. cruciata* (FISCHER, 1973) (Austria) and to *D. parapunctata* (FISCHER, 1976 (Austria, Hungary) with the help of FISCHER's key (1976: 345–348), the three species are differentiated by a few features keyed:

1 (2) Mandible medially 1.7 times as long as broad between teeth 1 and 3, its upper margin feebly directed upwards. Middle flagellomeres 1.4 times as long as broad, antenna with 20 antennomeres. 3-SR twice as long as 2-SR.
♀ 2 mm *D. cruciata* (FISCHER)

2 (1) Mandible medially 1.2 times as long as broad between teeth 1 and 3, its upper margin clearly directed upwards (Fig. 49). Middle flagellomeres twice as long as broad, antenna with 19 antennomeres. 3-SR three times as long as 2-SR. ♀ 2.1 mm ***D. tosgonii* sp. n.**

The distinction between *D. parapunctata* and *D. tosgonii* is presented as follows:

1 (2) Head in dorsal view 1.9 times as broad as mesonotum between tegulae. Head compressed dorso-ventrally, i.e. in lateral view head one-fourth longer than high, temple 1.3–1.4 times as long as eye (Fig. 37). Vein 4-SR

as long as 3-SR. Antenna of female with 16 antennomeres (that of male with 19). ♀♂ 1.5–1.8 mm *D. parapunctata* (FISCHER)

- 2 (1) Head in dorsal view 1.3–1.4 times as broad as mesonotum between tegulae. Head not compressed dorso-ventrally, i.e. usual in form, in lateral view head somewhat higher than long, temple as wide as eye (Fig. 48). Vein 4-SR 2.2–2.4 times as long as 3-SR. Antenna of female with 19 antennomeres. ♀ 2.1 mm ***D. tosgonii* sp. n.**

The new species is also related to *D. propelamur* sp. n. by its short mandible, however, they are fairly well separable by the features keyed:

- 1 (2) Antenna with 16 antennomeres, flagellomeres 3–12 1.3 times as long as broad. Vein 3-SR twice as long as 2-SR. Temple in dorsal view more bulging beyond eye (Fig. 31). Hind femur 3.3 times as long as broad. ♀ 2–2.1 mm ***D. propelamur* sp. n.**
- 2 (1) Antenna with 19 antennomeres, flagellomeres 3–15 twice as long as broad. Vein 3-SR three times as long as 2-SR. Temple in dorsal view less bulging beyond eye (Fig. 47). Hind femur four times as long as broad. ♀ 2.1 mm ***D. tosgonii* sp. n.**

***Dinotrema tuber* sp. n. ♂** (Figs 53–59)

Material examined (1 ♂). – Male holotype: Mongolia, Zavchan aimak, Choit church, 26 km ONO vom See Telmen nuur, 2150 m, 13 July 1968, leg. KASZAB (No. 1104); swept in a pine-wood and at the edge of the wood with luxuriant vegetation.

Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. No. 7820.

Etymology. – The species name “tuber” refers to the tuberculiformly projecting two spiracles on the propodeon.

Description of the male holotype. – Body 3 mm long. Antenna clearly one-fourth longer than body and with 29 antennomeres. First flagellomere just less than three times, second flagellomere 2.3 times as long as broad apically, further flagellomeres attenuating so that penultimate flagellomere 1.8 times as long as broad. – Head in dorsal view (Fig. 53) transverse, 1.76 times as broad as long, eye slightly longer than temple, latter rounded, occiput excavated. Ocelli less small, elliptic, OOL clearly twice as long as POL. Eye in lateral view 1.6 times as high as wide, temple a bit wider than eye and ventrally very faintly narrowing. Mandible (Fig. 54) 1.36 times as long as broad between teeth 1 and 3, tooth 2 pointed, tooth 1 less pointed and tooth 3 rounded. Tentorial pit small, its distance from eye somewhat longer than its own length. Face 1.6 times as wide as high, hairy. Head polished.

Mesosoma in lateral view 1.38 times as long as high. Notaulix restricted to anterior declivous part of mesonotum, deep. Mesonotal dimple guttiform. Declivous part of middle lobe of

mesonotum hair-punctate. Precoxal suture long, reaching fore margin of mesopleuron. Propodeon (Fig. 55) with a medio-longitudinal keel and anteriorly with a short, medio-transverse and strong keel, posteriorly with a less distinct areola, propodeon along keels rugulose, otherwise uneven, its upper (or horizontal) part smooth, shiny; pair of spiracles on a tuberculiform projection (Fig. 56). – Hind femur (Fig. 57) 5.5 times as long as broad distally. Hind basitarsus as long as tarsomeres 2–3 and one-third of tarsomere 4 combined.

Fore wing about 1.3 times as long as body. Vein 3–SR 2.2 times as long as 2–SR, 4–SR 2.3 times as long as 3–SR, faintly bent and reaching tip of wing. First subbasal cell (Fig. 58) relatively long, 1–2CU(1) twice as long as *m-cu*, CU1a stub-like and issuing somewhat posteriorly (see also arrows in figure cited).

Metasoma as long as head and mesosoma combined. First tergite (Fig. 59) 1.8 times as long as broad behind, pair of spiracles at middle of tergite, beyond spiracles tergite parallel-sided, pair of keels posteriorly merging into longitudinal rugosity. Further tergites polished.

Head, mesosoma and first tergite black, metasoma brown. Antenna brownish black. Mandible, palpi, tegulae and legs brownish yellow. Hind tibia apically and hind tarsus entirely brownish fumous. Wings hyaline, pterostigma and veins brownish.

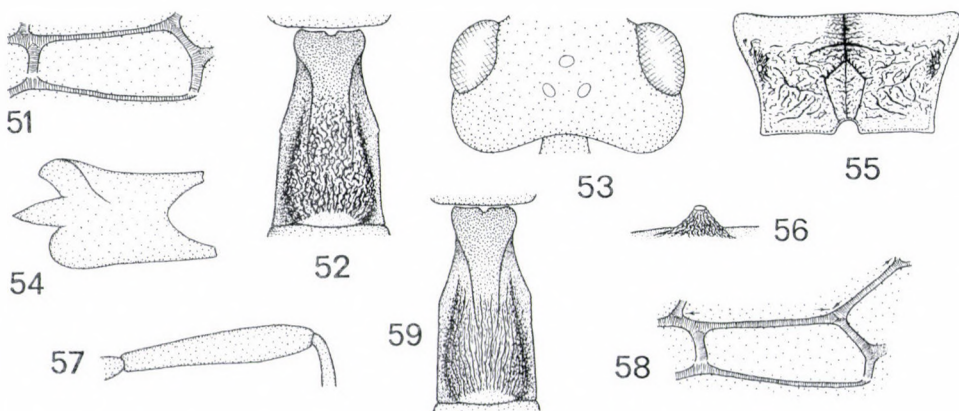
Female and host unknown.

Distribution: Mongolia.

The new species, *Dinotrema tuber* sp. n., is a member of the *signifrons*–*petiolata* species-group (FISCHER 1976) and is nearest to *D. falsifica* (STELFOX et GRAHAM, 1950) (Europe) considering their long antenna as well as high antennal numbers (at least twenty), less transverse head and long mandible; the male of the two species are separated by the following features:

- 1 (2) Pair of spiracles of propodeon sitting on tubercles (Fig. 55–56). Antenna with 29 antennomeres. Second submarginal cell long, 3–SR 2.2 times as long 2–SR. Mandible 1.36 times as long as broad. Precoxal suture long, reaching fore margin of mesopleuron. ♂ 3 mm

D. tuber sp. n.



Figs 51–59. *Dinotrema tosgonii* sp. n.: 51 = subbasal cell, 52 = first tergite. – *D. tuber* sp. n.: 53 = head in dorsal view, 54 = mandible, 55 = propodeon, 56 = propodeal tuber in lateral view, 57 = hind femur, 58 = subbasal cell + *m-cu*, 59 = first tergite

- 2 (1) Pair of spiracles of propodeon not sitting on tubercles as usually. Antenna with 23 antennomeres. Second submarginal cell short, 3–SR 1.4 times as long as 2–SR. Mandible twice as long as broad. Precoxal suture short, not reaching margin of mesopleuron. ♂ 2.1 mm

D. falsifica (STELFOX et GRAHAM)

The new species runs to *D. matridigna* (FISCHER, 1974) (Austria) when considering its pair of projecting spiracles on propodeon, however, they are differing by a few specific features keyed:

- 1 (2) Head in dorsal view twice as broad as long, eye 1.7 times as long as temple. Propodeon with a full transverse keel. First tergite twice as long as broad behind. Hind femur 4.5 times as long as broad. Antenna of female with 23 antennomeres. First tergite yellowish brown. ♀ 2.5 mm

D. matridigna (FISCHER)

- 2 (1) Head in dorsal view 1.76 times as broad as long, eye slightly longer than temple (Fig. 53). Propodeon with a short transverse keel (Fig. 55). First tergite 1.8 times as long as broad behind. Hind femur 5.5 times as long as broad distally (Fig. 57). Antenna of male with 29 antennomeres. First tergite brownish black. ♂ 3 mm

***D. tuber* sp. n.**

***Synaldis kaszabiana* sp. n. ♀**

(Figs 60–64)

Material examined (17 ♀). – Female holotype and seven female paratypes: Mongolia, Mittलगobi aimak, 20 km S von Somon Delgerzagt, 1480 m 9 June 1967, leg. KASZAB (No. 779); taken with soil pit-fall trap in a sandy area with *Lasiagrostis* herbs. – Eight female paratypes: Mongolia, Mittलगobi aimak, Choot bulag, zwischen Chuld und Delgerchangaj, 1480 m, 10 June 1967, leg. KASZAB (No. 782); taken with soil pit-fall trap in an area with *Caragana* herbs. – One female paratype: Mongolia, Bulgan aimak, 11 km W von Somon Bajannuur am See Bajan nuur, 1000 m, 14 June – 24 July 1968, leg. KASZAB (No. 958); taken with soil pit-fall trap in an area with *Caragana* and *Lasiagrostis* herbs.

Holotype and 16 paratypes are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7821 (holotype) and 7822–7837 (paratypes).

Etymology. – The new species is dedicated to its collector, Dr. Z. KASZAB, persistent explorer of the entomological fauna of Mongolia.

Description of the female holotype. – Body 1.9 mm long. Antenna short, as long as head and mesosoma combined and with 15 antennomeres. First flagellomere twice as long as broad apically, third to eighth flagellomeres 1.3 times as long as broad, flagellomeres 9–12 progressively somewhat attenuating so that penultimate flagellomere 1.6 times as long as broad (Fig. 60). – Head in dorsal view (Fig. 61) transverse, 1.7 times as broad as long, eye as long as temple, temple somewhat bulging beyond eye, i.e. head between temples somewhat broader than between eyes. Ocelli

small and elliptic. POL almost twice as long as OOL. Mandible (Fig. 62) fairly large and clearly broadening distally, between teeth 1 and 3 broader than its length medially. Tooth 2 pointed, tooth 1 rounded, tooth 3 widely rounded. Tentorial pit small and elliptic, not reaching eye. Head polished, face hairy.

Mesosoma in lateral view 1.5 times as long as high, head in dorsal view 1.5 times as broad as mesosoma between tegulae. Mesonotal dimple linear. Propodeon along medio-longitudinal line rugulose, close around lateral pair of spiracles also rugulose, otherwise propodeon polished; spiracles small (Fig. 63). Precoxal suture short, restricted to middle of mesopleuron, finely crenulate. – Hind femur 3.3 times as long as broad at middle. Hind basitarsus as long as tarsomeres 2–3 combined.

Fore wing somewhat longer than body. Vein 4–SR somewhat more than twice as long as $r + 3$ –SR combined. Subbasal cell closed and distally widening, *CUIa* issuing from middle of vein 3–*CUI* + *CUIb* combined.

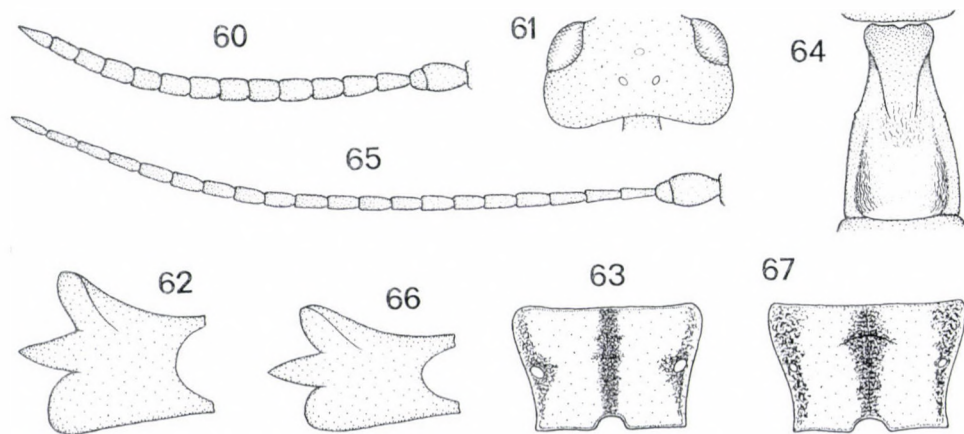
Metasoma somewhat shorter than head and mesosoma combined. First tergite (Fig. 64) 1.65 times as long as broad behind, 1.6 times as broad behind as basally, nearly evenly broadening posteriorly; pair of basal keel short, pair of lateral spiracles at middle of tergite; antero-medially and laterally uneven, posteriorly polished. Further tergites also polished. Ovipositor sheath as long as half of hind tibia.

Head and metasoma dark brown, vertex and mesosoma blackish brown. Scape and pedicel brown, flagellum dark brown. Mandible brownish yellow, palpi pale. Tegula yellowish brown. Legs yellow, hind coxa with brownish suffusion. Wings hyaline, pterostigma and veins brownish yellowish.

Description of the female paratypes (16 ♀). – Similar to the female holotype. Body 1.8–2.2 mm long (1.8: 4 ♀, 1.9: 7 ♀, 2: 3 ♀, 2.1: 1 ♀, 2.2: 1 ♀). Antenna with 13–15 antennomeres (13: 2 ♀, 14: 9 ♀, 15: 5 ♀). Hind femur 3.2–3.5 times as long as broad medially (3.2: 6 ♀, 3.3: 3 ♀, 3.5: 7 ♀). First tergite 1.6–1.7 times as long as broad behind.

Male and host unknown.

Distribution: Mongolia.



Figs 60–67. *Synaldis kaszabiana* sp. n.: 60 = antenna, 61 = head in dorsal view, 62 = mandible, 63 = propodeon, 64 = first tergite. – *S. armenica* FISCHER: 65 = antenna, 66 = mandible, 67 = propodeon

With the help of my key (PAPP 1996: 151–153) to the *Synaldis* species of Korea the new species, *Synaldis kaszabiana* sp. n., is nearest to *S. distenta* PAPP, 1994 (Korea) considering their short antenna, low number of antennomeres, form of first tergite and polished propodeon with medio-longitudinal keel or rugulosity; the two species are distinguished by the features keyed:

- 1 (2) Hind femur thick, three times as long as broad (Fig. 16 in PAPP 1994: 144). Head in dorsal view subcubic, 1.5 times as broad as long, temple not bulging (Fig. 13 l.c.). Mandible 1.5 times as long as broad, tooth 3 pointed (Fig. 14 l.c.). Antenna with 16 antennomeres. First tergite brownish yellow. ♀ 1.8 mm *S. distenta* PAPP
- 2 (1) Hind femur less thick, 3.2–3.5 times as long as broad. Head in dorsal view transverse, 1.75–1.8 times as broad as long, temple slightly bulging (Fig. 61). Mandible somewhat broader than long, tooth 3 rounded (Fig. 62). Antenna with 13–15 antennomeres. First tergite brown to dark brown. ♀ 1.8–2(–2.2) mm *S. kaszabiana* sp. n.

With the help of FISCHER's key (1993a: 567–572) the new species runs to *S. armenica* FISCHER, 1993 (Armenia), the two species are differentiated by the features keyed:

- 1 (2) Antenna as long as body and with 17–20 antennomeres, flagellomeres 7–20 twice as long as broad (Fig. 65). Mandible as long as broad, tooth 3 rounded (Fig. 66). Medio-longitudinal keel of propodeon anteriorly with a short and distinct transverse keel (Fig. 67). Ground colour of body brownish black. ♀ 1.2–1.5 m *S. armenica* FISCHER
- 2 (1) Antenna short, as long as head and mesosoma combined and with 13–15 antennomeres, flagellomeres 2–10 1.3 times as long as broad (Fig. 60). Mandible somewhat broader than long, tooth 3 rounded (Fig. 62). Propodeon medio-longitudinally rugulose (i.e. without keel), anteriorly without a transverse short keel (Fig. 63). Ground colour of body brown to dark brown. ♀ 1.8–2(–2.2) mm *S. kaszabiana* sp. n.

SPECIES OF THE *ASPILOTA* GENUS-GROUP
IN THE EAST PALAEARCTIC REGION

Under the area "East Palaearctic Region" I mean the following countries: Russia (east of the river Yenisei), Mongolia, China (north of the river Yangtze), Korea and Japan (except Islands Okinawa).

The *Aspilota* genus-group consists of ten genera (VAN ACHTERBERG 1988) of which five are represented in the East Palaearctic Region: *Aspilota* FOERSTER, *Carinthilota* FISCHER, *Dinotrema* FOERSTER, *Leptotrema* VAN ACHTERBERG and *Synaldis* FOERSTER (CHEN & WU 1994). Originally the majority of the species of the *Aspilota* genus-group have been described in the two genera *Aspilota* and *Synaldis*. WHARTON (1985) raised first the problem concerning the taxonomic-systematic contradictions of the genera *Aspilota*, *Dinotrema* and *Synaldis*. VAN ACHTERBERG (1988) proposed that the species assigned in these genera should be reclassified in the genera *Aspilota* and *Dinotrema* on the basis of the tentorial pit either reaching (*Aspilota*) or not reaching (*Dinotrema*) the lower margin of the compound eye (cf. Fig. 5–19 in WHARTON 1988: 229–233). In accepting this systematic standpoint the generic validity of *Synaldis* becomes uncertain because its species belong partly to *Aspilota* and partly to *Dinotrema* owing to the length of their tentorial pit (cf. FISCHER 1997: 107–110) and disregarding its generic feature, i.e. the absence of the alar vein 2–SR or *cuqul* (of the fore wing).

FISCHER (1997) pointed out that from the viewpoint of taxonomic practice it seems reasonable to keep in validity the genera *Aspilota*, *Dinotrema* and *Synaldis* until the taxonomic–systematic enigma, expounded before, is satisfactorily solved hopefully on the basis of a considerably better knowledge of these genera. Accordingly I apply also the genus *Synaldis* besides the genera *Aspilota* and *Dinotrema*.

In the subsequent checklist a total of 58 species are enumerated ranged in five genera (between parentheses the respective species number): *Aspilota* (5 species), *Carinthilota* (1 species), *Dinotrema* (29 species), *Leptotrema* (1 species) and *Synaldis* (22 species):

- Aspilota deserta* PAPP, 1967: Mongolia
elongata CHEN et WU, 1994: China
fuscicornis (HALIDAY, 1838): Mongolia
intermediana FISCHER, 1975: China
lousiae VAN ACHTERBERG, 1988: China
Carinthilota parapsidalis FISCHER, 1975: China
Dinotrema amoenidens (FISCHER, 1973): China
amoepilosum sp. n.: Mongolia

- aureliae* (FISCHER, 1973): Mongolia
brevimeres sp. n.: Mongolia
catharinae (FISCHER, 1973): Mongolia
flaviantenna sp. n.: Mongolia
glabra (STELFOX et GRAHAM, 1951): Mongolia
hosisense (FISCHER, 1976): China
kaszabi sp. n.: Mongolia
kempei (HEDQVIST, 1973): China
lineola (THOMSON, 1895): Mongolia
macrocera (THOMSON, 1895): Mongolia
mesocaudatum VAN ACHTERBERG, 1988: China
multiarticulatum VAN ACHTERBERG, 1988: China
(?)naevia (TOBIAS, 1962): Mongolia
nervosum (HALIDAY, 1833): Mongolia
notaulica (FISCHER, 1974): Mongolia
occipitale (FISCHER, 1973): China
oleraceum (TOBIAS, 1962): Mongolia
pembum sp. n.: Mongolia
pratense VAN ACHTERBERG, 1988: China
propelamur sp. n.: Mongolia
remotum sp. n.: Mongolia
tauricum (TELENGA, 1935): China
tosgonii sp. n.: Mongolia
tuber sp. n.: Mongolia
tuberculatum VAN ACHTERBERG, 1988: China
varipes (TOBIAS, 1962): Mongolia
?Dinotrema yasumatsui (WATANABE, 1957): Japan
Leptotrema dentifemur (STELFOX, 1943): China
Synaldis acutidentata FISCHER, 1970: China
cabinica ssp. *asiatica* PAPP, 1996: Korea
concinna (HALIDAY, 1838): Mongolia
concolor (NEES, 1814): Korea, Mongolia
distenta PAPP, 1994: Korea
distracta (NEES, 1834): China, Korea, Mongolia,
fuscoflava PAPP, 1994: Korea
globipes FISCHER, 1962: China
hirsuta PAPP, 1994: Korea
kaszabiana sp. n.: Mongolia
latistigma FISCHER, 1962: Mongolia
mandibulata FISCHER, 1970: China
maxima FISCHER, 1962: Mongolia

nigriceps PAPP, 1994: Korea
nitidula (MASI, 1933): China
nodosa PAPP, 1996: Korea
parvicornis (THOMSON, 1895): China
propedistractam PAPP, 1993: Korea
reducta (TOBIAS, 1962): Korea
sincerea PAPP, 1994: Korea
trematosa FISCHER, 1967: Korea
vestigata PAPP, 1994: Korea

*

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ORIBATID MITES (ACARI: ORIBATIDA) FROM UGANDA, II. ARCOPIA WITH COMMENTS ON GENERIC CONCEPTS

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Description and redescription of seven *Arcoppia* (Oribatida: Oppiidae) species from Uganda and the Ethiopian Region are given. The position and contents of the genus *Arcoppia* HAMMER, 1977 and the morphological features used in the diagnoses are discussed. New diagnosis for the genus and key for the Ethiopian (African) species are included. With 33 figures.

Key words: Oribatida, Oppiidae, *Arcoppia*, diagnosis and key, new species, new synonyms, new combinations, Uganda

INTRODUCTION

For quite some times dr. T. PÓCS, renown bryologist, and I have studied the similarities in the distribution of moss floras and oribatid mites in the Ethiopian and the Oriental region (South-east Asia). Our research yielded numerous taxonomic papers both in the acarological and in the bryological literature, but we still lack data from many regions. One of these was Uganda. Fortunately dr. T. PÓCS had the opportunity to organise a collecting trip, and the elaboration of these samples is under way. The present contribution is the second part in this series (see MAHUNKA 1998).

One of the biggest surprises was the unusually high number of oppiid species recovered from the samples gathered in the Ichuya Forest Reserve, Kabale District. The greatest proportion of these belongs to the genus *Arcoppia* HAMMER, 1977 or its near relatives. My examinations so far have never revealed 7 species together in one sample of apparently close relatives of this oppioid genus. This peculiarity forced me to delve more deeply into the species composition of this genus inhabiting the Ethiopian region. I must note that the relationships of the oppioid taxa is of paramount importance in acarology.

TAXONOMIC NOTES ON THE GENUS *ARCOPPIA* HAMMER, 1977

The genus *Arcoppia* was described by HAMMER (1977)* along with the type species: *Arcoppia brachyramosa*, and was readily accepted by all specialists. BALOGH (1983) also applied it as type genus of a subfamily, while RODRIGUEZ and SUBIAS (1984) elaborated it monographically. In spite of the fact that the taxon is amply definable FRANKLIN and WOAS (1992), recently, repressed it into *Oppia* C. L. KOCH, 1835 with subgeneric status.

In contrary to the latter opinion, the heterogeneity of the "basic genus" was evaluated by several authors (BALOGH 1983, SUBIAS & BALOGH 1989), and for some extreme forms new genera were proposed (*Mimoppia* BALOGH, 1983, *Wallworkoppia* SUBIAS, 1989 (= *Wallworkella* BALOGH 1983). Other authors described closely allied genera (*Basidoppia* MAHUNKA, 1983, *Similoppia* MAHUNKA, 1983, *Reductoppia* BALOGH, 1984). It is still a pending problem because when the new genera were proposed the distinctions were based in every occasion on a single characteristic feature. At a first approximation it appeared that these are not better than extreme variations of a single feature, which cannot be correlated with variations of the other features. Consequently a revision is inevitable.

The subfamily erected by BALOGH – in spite of the fact that part of its genera displays definite relationship – is a highly uncertain taxon in itself. Thus, it is not surprising that both in its content and diagnosis the taxon suffered several changes. The most recent version of the subfamily may be pinpointed in the work of BALOGH and BALOGH (1992). Although an exact diagnosis is absent the identification key allows one may surmise diagnosis by tracing back what the authors had in mind regarding the diagnoses of the included genera. Unfortunately, owing to certain errors in the key some incorrect data crept into the diagnoses (see p. 76).

The real problem is hidden in the confusion existing in the differential characteristics of the genera belonging to Oppiidae (s. l.). The problem stems from the two irreconcilable views regarding the classification of the family. I have already expounded (MAHUNKA & PALACIOS-VARGAS 1998) on this question, but according to my opinion:

1. The Oppiidae has several, well definable, unified species groups which may be considered genera.
2. A rather meticulous division of the family is needed even if it does not conform with the family's real, phylogenetical system.
3. The family cannot yet be divided into subfamilies, consequently, the prevailing system should be discarded.

* FRANKLIN & WOAS (1992) consistently publish HAMMER, 1979 (sic!).

When interpreting the genus *Arcoppia* and its relatives it would be worth while to scrutinise the characteristics applied in the generic (subfamilial) diagnosis of BALOGH (1983), SUBIAS & BALOGH (1989) and BALOGH & BALOGH (1992). I am afraid that there is hardly any feature which might support relationship theories. Particularly missing is the structure of the leg, which, I believe, will be of paramount importance. Thus:

Rostrum divided or undivided. In several groups of the family, independently from one another, this feature occurs in parallel. However, in the case of closely related genera it may be of decisive value.

Number of genital setae. On the generic level, it is decisive; it is more than evident that it shows relationship.

Number of notogastral setae. On the generic level this is a very important characteristic. Decisive is the presence or reduction of setae.

Position of adanal lyrifissure (iad). This must be of decisive value on the generic level. Within the genus the paraanal, inverse apoanal and direct apoanal positions are constant. It is highly probable that in proving relationship the feature will have a role.

Position of adanal setae. When there is a marked difference in the positions of setae ad_1 and ad_3 this feature will be important, good at the generic level. However, it seems more than probable that within certain genera it may vary or will show transitions.

Costulae of prodorsum. The presence or absence of the structure of prodorsum is highly significant. The partly or entirely horseshoe-like median and the approximately S-shaped lateral costulae of *Arcoppia* may well show up in other distant groups also (*Subiasella* BALOGH, 1983, *Lanceoppia* HAMMER, 1962, *Acutoppia* BALOGH, 1983, *Brachioppiella* HAMMER, 1962). The presence or absence of the costula or lamellar line does not suggest relationship, but is definitely a good differential feature.

Shape of sensillus. On the generic and subgeneric levels it is characteristic only within certain limits. But it is highly unlikely that within a genus one may find e.g. both pectinate and globular sensillus. The applicability of this characteristic needs further study, but I hold the view that using it alone is a folly.

Besides the above listed features which are certainly reliable in showing *Arcoppia* relationships, the subsequently enumerated characteristics are also significant in separation. However, the above authors only in exceptional cases referred to them:

Position of setae 1c. Basically these setae occupy two positions, either removed from pedotecta I, on the costula delimiting the epimeres, or on the basal margin of pedotecta I. It is a definite feature on the generic level, and *Arcoppia* always has the first variation.

Position of acetabula and the distance between them. The acetabula of the four legs may be arranged into a transversal row, or one of them (mostly the 3rd) may shift. This shifting may be characteristic for the species or species-groups (?). On the other hand, a strong backward shift of acetabulum 4, which is usually accompanied with a modification for the coxisternal region, must be regarded a subgeneric feature; it may appear in several groups.

Inner costula parallel with the discidium or an arcuate or outer costula above it. The inner costula is always present in directly related genera, while the presence or absence, furthermore, the size of the arcuate costula are features of the species.

Chaetotaxy of the genu, tibia and tarsus of leg IV. The proportion of setae *d* and *l''* on the genu, the direction and length of the solenidium on the tibia, and the pennate structure of setae *v''* and *a''* on the tarsus are features which partly describe genera and partly species.

Direction of S-shaped lateral costula. The costula may either be directed towards the acetabulum and ends there, or by recurving encloses an oval field. This characteristic may only be used within the genus; consequently, it is a specific feature.

Considering the above discussed characteristics the generic diagnosis of *Arcoppia* may be modified accordingly:

Diagnosis:* Rostral apex tripartite. Rostral setae arising on dorsal surface. Prodorsum with one unpaired, horseshoe-shaped, median and one pair of S-shaped, lateral costulae. This region framed posteriorly by a transverse line combined with two pairs of sigillae. Sensillus with head bearing branches (at least one long seta on the dilated head). One pair of porose areae in the dorsosejugal region. One or more thickenings medially, in the basal (posterobothridial) part of prodorsum. Exobothridial region and the surface around acetabula I-III granulated or pustulated, (or at least) with well sclerotised crests. Crista on notogaster absent. Ten pairs of notogastral setae present, setae *c*₂ shorter than the others. Gnathosoma normal. Epimeral surface with polygonal pattern or alveoli. Epimeral border and apodemes (at least the sejugal and apodeme 4) well developed. Epimeres 1 and 2 clearly framed laterally by a pair of longitudinal crests, bearing always setae *1c*. Pedotecta I small, discidium large. Along the discidium posteriorly well sclerotized laths run to acetabula IV. Epimeral setal formula: 3-1-3-3. Anogenital setal formula: 6-1-2-3. Setae *ad*₁ in postanal, *ad*₃ in preanal, lyrifissures *iad* in adanal position. Position of acetabula varying. Legs oppiid type: tibia and tarsus of legs I and II moderately elongated, femora of these legs slightly incrassate. Tibiae and tarsi of legs III and IV normal, not con-

* The unvaried features mentioned in the diagnosis will not be discussed in the description of the species.

spicuously elongated. Legs setal formulae: I: 1 - 5 - 2+1 - 4+2 - 20+2 - 1, IV: 1 - 2 - 2 - 3+1 - 10 - 1.

In evaluating the above morphological characteristics the following conclusions may be drawn in connection with relationships of:

Mimoppia BALOGH, 1983 should be retained as a separate genus, considering the backward removed leg IV, the strongly elongate discidium and epimeres III-IV, the paranal position of setae *ad*₁, the lack of a strongly thickened head of the sensillus.

Wallworkoppia SUBIAS, 1989 should better be treated as a subgenus of *Arcoppia* owing to its single characteristic feature: the pectinate sensillus. The taxon is rather heterogeneous.

Basidoppia MAHUNKA, 1983 should be retained as a separate genus. It is well separable from the above-mentioned genera and *Arcoppia* by the differently shaped rostrum (median apex absent), the conspicuously broad median horse-shoe-shaped costula is, the shape of the sensillus being fusiform with short branches, or ciliate. *Oppia angolensis* BALOGH, 1958 should unequivocally be relegated here; thus, *Oppia angolensis* BALOGH, 1958 = *Basidoppia angolensis* (BALOGH, 1958) **comb. n.**

Similoppia MAHUNKA, 1983. The type-species of this genus was again studied and I found that the rostrum is tripartite, and setae *c*₂ is very small, but it is present. Considering its habitus and the sculpture of its prodorsum it should rather be treated as a subgenus of *Basidoppia*. Thus, *Basidoppia* (*Similoppia*) **stat. n.**

Taken as a whole, these genera are practically circumtropical in distribution, although some species may occur in the Mediterranean region. The subsequent list of species has been ascertained from the Ethiopian region, including some nearby African and south Mediterranean territories. The list is mainly based on the two papers of BALOGH (1983) and SUBIAS and BALOGH (1989) with some additions of mine.* In the subsequent list the species were originally described into the genus as given in the following five headings.

Arcoppia

(?) *Oppia angolensis* BALOGH, 1958 = *Basidoppia* (*Basidoppia*) *angolensis* BALOGH, 1958

(?) *Oppia angolensis radiata* WALLWORK, 1961 = species incertae sedis

Arcoppia bacilligera MAHUNKA, 1983 = *Arcoppia* (*Arcoppia*) *bacilligera* MAHUNKA, 1983

Oppia corniculifera MAHUNKA, 1978 = *Arcoppia* (*Arcoppia*) *corniculifera* (MAHUNKA, 1978)

Oppia fenestralis WALLWORK, 1961 = *Arcoppia* (*Arcoppia*) *fenestralis* (WALLWORK, 1961)

* The species relegated to this group by SUBIAS and BALOGH on the basis of the undivided rostrum and the position of lyrifissure *iad* are not related to *Pletzenoppia semicostulata* MAHUNKA, 1985.

Oppia gilva WALLWORK, 1961 = *Arcoppia* (*Arcoppia*) *gilva* (WALLWORK, 1961)
Oppia grucheti MAHUNKA, 1978 = *Arcoppia* (*Arcoppia*) *grucheti* (MAHUNKA, 1978)
Arcoppia guineana PÉREZ-INIGO, 1981 = *Arcoppia* (*Arcoppia*) *guineana* PÉREZ-INIGO, 1981
Arcoppia mahunkai SUBIAS, 1984 = *Arcoppia* (*Arcoppia*) *mahunkai* SUBIAS, 1984
Arcoppia pergeli MAHUNKA, 1982 = *Arcoppia* (*Arcoppia*) *rugosa* (MAHUNKA, 1973) **syn. n.**
Arcoppia perezinigo SUBIAS, 1984 = *Arcoppia* (*Arcoppia*) *perezinigo* SUBIAS, 1984
Arcoppia perisi SUBIAS, 1984 = *Arcoppia* (*Arcoppia*) *perisi* SUBIAS, 1984
Oppia rugosa MAHUNKA, 1973 = *Arcoppia* (*Arcoppia*) *rugosa* (MAHUNKA, 1973)
Pletzenoppia (?) *semicostulata* MAHUNKA, 1985 = *Pletzenoppia semicostulata* MAHUNKA, 1985
Arcoppia tuberosa MAHUNKA, 1988 = *Arcoppia* (*Arcoppia*) *tuberosa* MAHUNKA, 1988

Basidoppia

Basidoppia basidii MAHUNKA, 1983 = *Basidoppia* (*Basidoppia*) *basidii* MAHUNKA, 1983
Oppia demeteri MAHUNKA, 1982 = *Basidoppia* (*Basidoppia*) *demeteri* (MAHUNKA, 1982)
Basidoppia psyla MAHUNKA, 1983 = *Basidoppia* (*Basidoppia*) *psyla* MAHUNKA, 1983
Basidoppia pocorum MAHUNKA, 1993 = *Basidoppia* (*Basidoppia*) *pocorum* MAHUNKA, 1993

Mimoppia

Oppia tenuiseta WALLWORK, 1961 = *Mimoppia tenuiseta* (WALLWORK, 1961)

Similoppia

Similoppia halterata MAHUNKA, 1983 = *Basidoppia* (*Similoppia*) *halterata* (MAHUNKA, 1983)
comb. n.

Wallworkoppia

Arcoppia granulata (MAHUNKA, 1986) = *Arcoppia* (*Wallworkoppia*) *machadoi* (BALOGH, 1958).
syn. n.
Oppia machadoi BALOGH, 1958 = *Arcoppia* (*Wallworkoppia*) *machadoi* (BALOGH, 1958)
Oppia trimucronata WALLWORK, 1961 = *Arcoppia* (*Wallworkoppia*) *trimucronata* (WALLWORK, 1961)
Wallworkella vibrissa MAHUNKA, 1983 = *Arcoppia* (*Arcoppia*) *vibrissa* (MAHUNKA, 1983)

The herewith described five species should be added here:

Arcoppia (*Arcoppia*) *inequirostralis* sp. n.
Arcoppia (*Arcoppia*) *obtusa* sp. n.
Arcoppia (*Arcoppia*) *parasensillus* sp. n.
Arcoppia (*Arcoppia*) *piffli* sp. n.
Arcoppia (*Arcoppia*) *secata* sp. n.

- 5 (4) Interbothridial region or the surface behind it with only 1–4 “tubercles” or pustules.
- 6 (7) Median horseshoe-shaped costula located far behind the anterior part of S-shaped lateral costulae. *rugosa* MAHUNKA, 1973
- 7 (6) Median horseshoe-shaped costula located in a transverse line with the anterior margin of S-shaped lateral costulae.
- 8 (9) Median rostral apex clearly shorter than the two lateral ones. All notogastral setae simple, setiform, setae *la* much shorter than distance between setae *la* and *lm* *inaeqirostralis* sp. n.
- 9 (8) All three rostral apices equal in length. Notogastral setae much longer, some of them S-shaped, setae *la* longer than distance between setae *la* and *lm* *piffli* sp. n.
- 10 (3) Interlamellar setae clearly shorter than distance between their alveoli and median transversal costula.
- 11 (12) Sensillus gradually dilated, spindle-shaped, without true head. Sensillar branches arising unilaterally, one and each other. Setae *la* twice longer than setae *lm* *parasensillus* sp. n.
- 12 (11) Sensillus with true head, clearly separated from peduncle. Branches arising on head only. Setae *la* and *lm* equal in length.
- 13 (14) Branches of sensillus with secondary branches or spines. Median part of the horseshoe-shaped costula interrupted medially *vibrissa* MAHUNKA, 1983
- 14 (13) Branches of the sensillus smooth. Median part of horseshoe-shaped costula complete.
- 15 (16) Head of sensillus with one long branch, by it at least 1–2 very short, spines present. Notogastral setae conspicuously ciliate *bacilligera* MAHUNKA, 1983
- 16 (15) Head of sensilli with at least 3, gradually shortening branches.
- 17 (20) S-shaped lateral costula directed toward acetabulum of leg I. Median rostral apex much broader basally than apically.

- 18 (19) Interbothridial region or surface behind it with many tubercles or pustules. Median rostral apex longer than lateral ones
fenestralis (WALLWORK, 1961)
- 19 (18) Interbothridial region or surface behind it only with one pair of tubercles. Median rostral apex shorter than the lateral ones
gilva (WALLWORK, 1961)
- 20 (17) S-shaped lateral costula endoses an oval structure, not directed to acetabulum of leg I. Median rostral apex never broadening basally.
- 21 (22) Median rostral apex broad, incisure along it narrow. S-shaped lateral costula slightly protruding beyond median transversal costula *obtusa* sp. n.
- 22 (21) Median rostral apex conspicuously narrow, incisure broad. S-shaped lateral and median transversal costula ending in a transverse line anteriorly
secata sp. n.

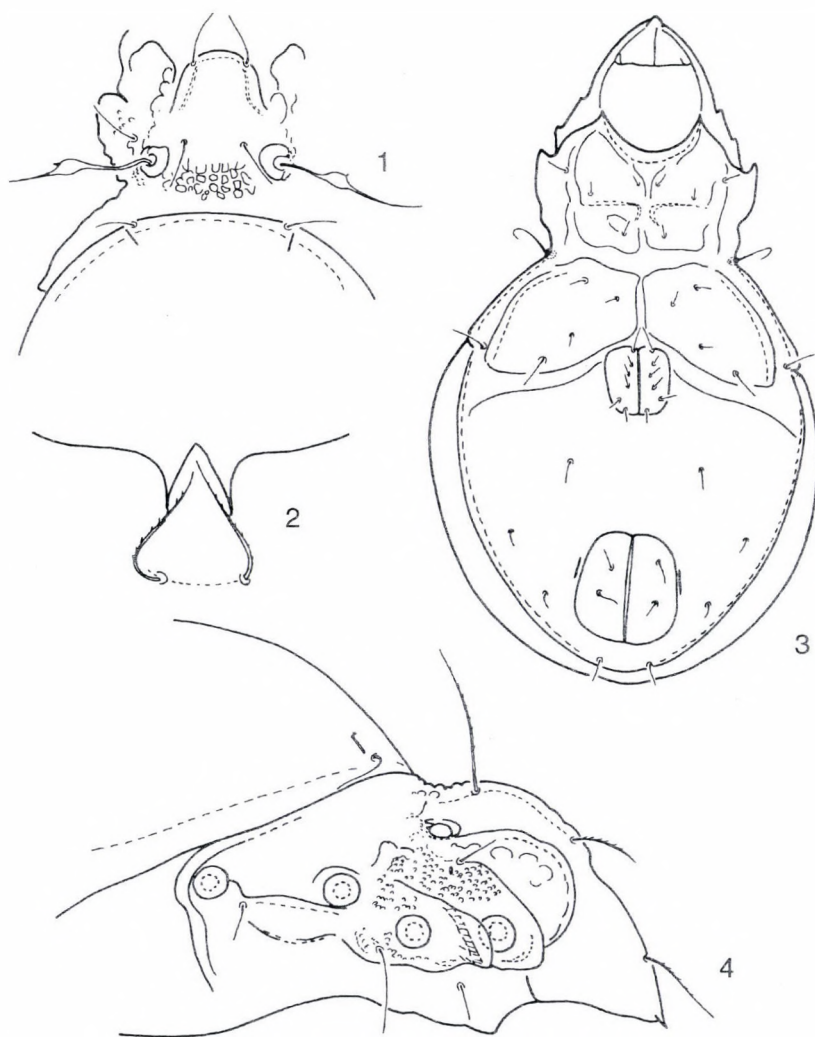
Arcoppia (*Wallworkoppia*) SUBIAS, 1989

- 1 (2) Lateral branches of sensillus simple, smooth. Rostral incisions normal, median apex normal, but shorter than lateral ones. S-shaped lateral costula not projecting beyond transverse one *machadoi* (BALOGH, 1958)
- 2 (1) Branches of sensillus with secondary ramifications. Rostral incisions wide, U-shaped. Median rostral apex rounded, fungiform, shorter than the lateral ones. S-shaped lateral costula projecting beyond transverse one
trimucronata (WALLWORK, 1961)

Basidoppia (*Basidoppia*) MAHUNKA, 1983

- 1 (6) Sensillus with long distal branches, their length greater than the diameter of the head.
- 2 (3) Basal part of prodorsum with two pairs of tubercles continuing backwards in the sejugal region *demeteri* (MAHUNKA, 1982)
- 3 (2) Basal part of prodorsum with one pair of round tubercles.

- 4 (5) Small species, body no longer than 265 μm . Notogastral setae very short, length of setae *la* smaller than the distance between setae *la* and *lm*
psyla MAHUNKA, 1983
- 5 (4) Larger species, body length: 295–327 μm . Notogastral setae nearly as long as the distance between setae *la* and *lm*
angolensis (BALOGH, 1958)



Figs 1–4. *Arcoppia (Arcoppia) corniculifera* (MAHUNKA, 1978): 1 = median part of prodorsum, 2 = body in ventral view, 3 = rostrum, 4 = podosoma in lateral view

- 6 (1) Sensillus with short distal spicules.
- 7 (8) Two pairs of large tubercles in the basal part of the prodorsum
pocsorum MAHUNKA, 1993
- 8 (7) One pair of tubercles in the basal part of the prodorsum
basidii MAHUNKA, 1983

DESCRIPTIONS AND REDESCRIPTIONS

Arcoppia (Arcoppia) corniculifera (MAHUNKA, 1978) (Figs 1–4)

The original diagnosis is inadequate since it does not discuss the most important features. What is more, the ventral side and the lateral view of the podosoma are not depicted (MAHUNKA 1978). These are supplied herewith on the basis of the type series.

The description should be complemented with the following:

Rostral apex (Fig. 3) wide, not shorter than the lateral ones. Shape of costulae typical, the median, horseshoe-shaped one located slightly behind the lateral ones (Fig. 1). Interlamellar setae long, this feature clearly seen in lateral view of podosoma (Fig. 4). S-shaped lateral costulae also strong, directed to acetabula of legs I. Exobothridial region well pustulate.

Ventral parts of body (Fig. 2): Epimeral borders and apodema well developed and sclerotised. Among them *bo*₂ short, indistinct, sternal border in front of them partly absent. Sejugal border broad. Epimeres I and II framed laterally by the typical, arched ridges, setae *1c* arising on them. Discidium long, rounded posteriorly. Longitudinal ridge, along the discidium long, directed to acetabula IV. Setae *4c* arising on inner margin of discidium. Epimeral setae of normal size. Setae *3c*, *4b* the longest of all. Genital setae arranged in two longitudinal lines, 1, 2, 3, 4 and 6 located near to inner margin, setae 5 nearer to lateral one.

Arcoppia (Arcoppia) inaequirostris sp. n. (Figs 5–8)

Measurements – Length of body: 493–526 µm, width of body: 268–280 µm.

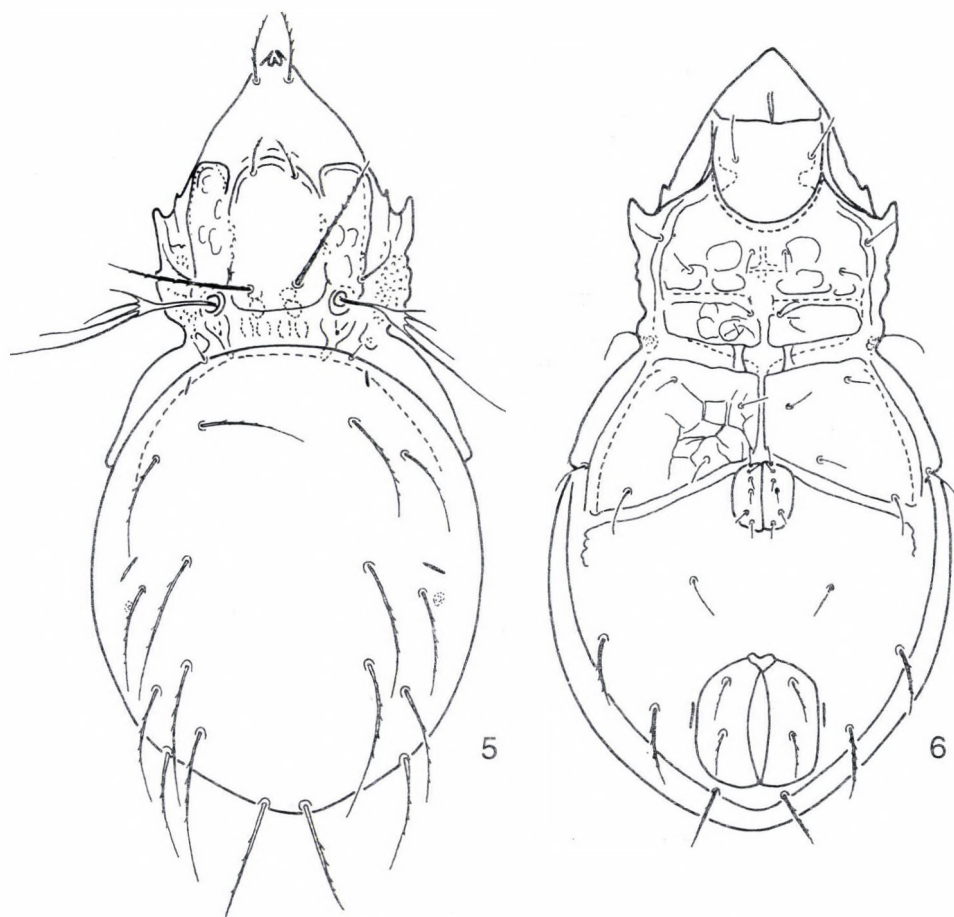
Prodorsum: Rostrum tripartite, but median apex clearly shorter than lateral ones. Incisions among between them deep. Shape of costulae typical, the median, horseshoe-shaped one comparatively narrow, well arched and slightly protruding beyond lateral ones (Fig. 5). The longitudinal parts short anteriorly, followed by granules, and the basal part are again laths, directed to bothridia. S-shaped lateral costulae also strong, straight anteriorly, running posteriorly, behind with bothridia, bearing the exobothridial setae. Their anterolateral lines run to acetabula. Interlamellar region with two pairs of great and round sigillae present, behind them a transversal line observable. In the interbothridial region two pairs of indistinct "tubercles". Cervical part of prodorsum with one pair of strong apophyses connected to bothrydia, directed medially and one pair of indistinct porose areae also visible in the sejugal region. Bothridia medium large, nearly quadrangular with very small,

posterior apophysis. Rostral setae arising in normal position. Lamellar setae very short but thick, well ciliated. Interlamellar setae very long and strong, much longer than rostral ones. Sensillus typical for the genus, medium long, with distinct head bearing 4 branches of different lengths.

Lateral part of podosoma: S-shaped lateral costula directed to acetabulum of leg I. Position of acetabula normal, located abreast of each other (Fig. 7). Exobothridial region and a field between acetabula I and II distinctly granulated by small granules. Pedotecta I normal, rounded, discidium well developed. No arched lath beyond acetabula III and IV.

Notogaster: Narrow and elongate. Median part of dorsosejugal line normal. Ten pairs of notogastral setae present, setae c_2 short, simple, all others much longer, some fine cilia well observable. Setae la arising clearly in front of lm . Great differences exist in their lengths, e.g. setae la , lm and h_3 nearly equal in length, and clearly shorter than lp , h_2 and h_3 (Fig. 5). Setae p_1 , p_2 , and p_3 not shorter than setae la or lm .

Ventral parts of the body (Fig. 6): Epimeral borders and apodema mostly well developed and sclerotised. Among them bo_2 short, indistinct, sternal border in front of them partly absent. Se-



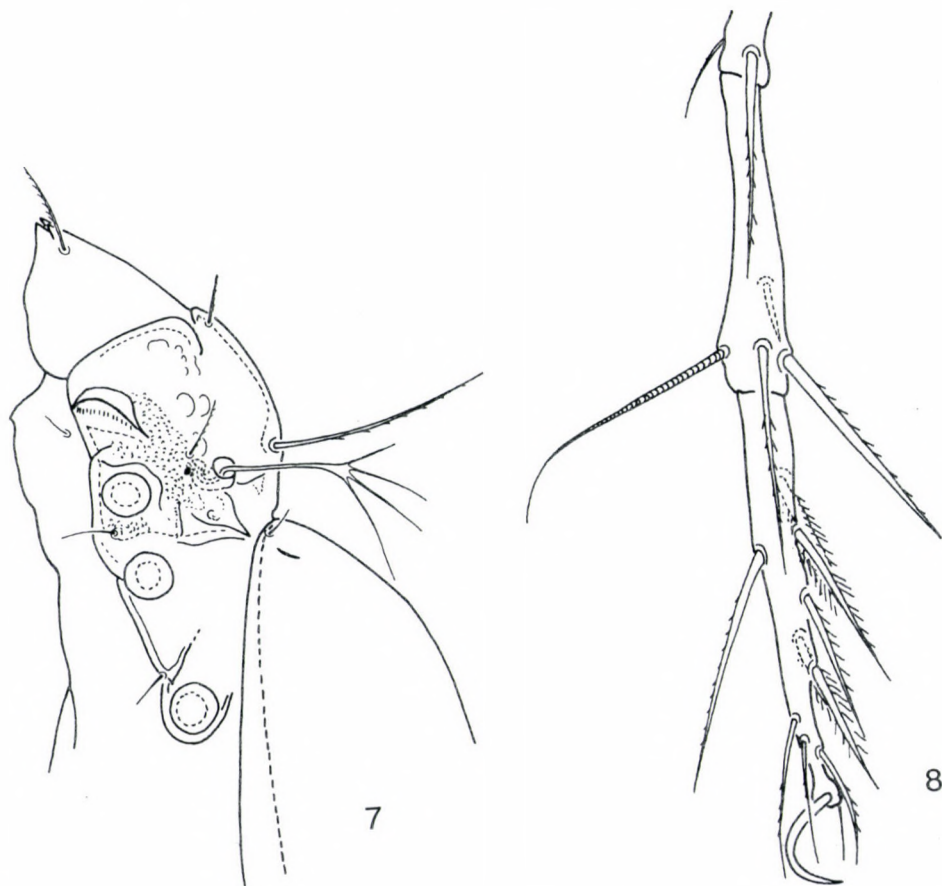
Figs 5–6. *Arcoppia (Arcoppia) inaequirostris* sp. n.: 5 = body in dorsal view, 6 = body in ventral view

jugal border broad, this and median part of *bo.* 2 with two arcuate connecting lines medially. Polygonal pattern and/or large alveoli observable on all epimeres, especially on epimeres I. Epimeres I and II framed laterally by arched ridges, setae *1c* arising on them. Discidium conspicuously long, rounded posteriorly. Longitudinal ridge, along the discidium long, directed to acetabula IV. Setae *4c* arising on inner margin of discidium. Epimeral setae of normal size, but they are mostly spiniform. Setae *3c*, *4b* longest of all. Genital setae arranged in two longitudinal lines, 1, 2, 3, 4 and 6 located near to inner margin, setae 5 nearer to lateral one. Position of aggenital and anal setae normal (Fig. 6), these setae much longer and stronger than the epimeral or anal ones and clearly ciliated.

Legs: Solenidium of tibia IV conspicuously long, arched. Great differences exist between the genual and tibial setae of leg IV. Setae *1'* of genu very long and strong, similar to setae *1'* and *v'* of tibia (Fig. 8). Setae *v''* and *a''* of leg IV plumose.

Remarks: The new species is well characterised by the conspicuously strong adanal setae.

Material examined: Holotype Uganda, Kabale District, Ichuya forest Reserve, S of Rwaburimbe village, along the Kabales? Kisoro road above Kanaba Gap at 2400–2440 m alt. 1°14.9'S,



Figs 7–8. *Arcoppia (Arcoppia) inaequirostris* sp. n.: 7 = podosoma in lateral aspect, 8 = leg IV

29°48.3'E. Bamboo *Sinarundinaria alpina*) forest, 10–12 m tall), 1997. leg. T. Pócs. 4 paratypes from the same sample. Holotype (1602–HO-98) and 3 paratypes (1602–PO-98) (with identification numbers of the specimens in the Collection of Arachnida) are deposited in the Hungarian Natural History Museum, Budapest, and 1 paratype in the Muséum d'Histoire naturelle, Genève.

Etymology: Named after the ratio of the rostral apices.

Arcoppia (Arcoppia) obtusa sp. n.

(Figs 9–13)

Measurements – Length of body: 356–383 µm, width of body: 196–219 µm.

Prodorsum: Rostrum tripartite, median apex broad and obtuse, lateral ones sharply pointed (Fig. 10). All three apices equal in length, or median one slightly longer, incisions between them narrow, deep. Shape of costulae typical, the median, horseshoe-shaped one is broad, its transversal part arched (Fig. 9). Its longitudinal parts long, well developed, directed to bothridia, their basal part with granules. S-shaped lateral costulae very strong, slightly projecting beyond transversal one. Their basal part thick bearing the exobothridial setae. Interlamellar region with two pairs of sigillae, behind them a transversal line framed this region. Interbothridial region with three pairs, partly indistinct tubercles medially. Sejugal region with one pair of porose areas. Bothridia large, with posterior apophysis. Rostral setae arising medially, near to each other. They are much longer than lamellar ones. The latter also shorter than interlamellar setae. Sensillus (Fig. 13) with dilated, typical head, bearing 3 (2 or 4) long branches of different

Lateral part of podosoma: Lateral costulae framing an elongated, enclosed field and their lateral lines not reaching acetabula I. Exobothridial region and fields between acetabula I, II and III well granulated, granules comparatively large. Some well sclerotised longitudinal crests also present. A porose area in the sejugal region well observable. Position of acetabula III and IV above acetabula I and II (Fig. 12). Pedotecta I small, discidium well developed. Setae 4c arising on their posterior margin. An arched, strong lath running beyond acetabula III and IV.

Notogaster: Broad, ovoid. Median part of dorsosejugal line normal, gradually arched. Ten pairs of notogastral setae present, setae *c*₂ short, simple, all others much longer, finely roughened. Setae *la* arising clearly in front of *lm* (Fig. 5). Setae *p*₁, *p*₂, and *p*₃ only little shorter than the others.

Ventral parts of the body (Fig. 11): Epimeral region conspicuously well sclerotised, especially lateral borders thick, bearing short setae. Among the borders *bo*. 2 indistinct, sternal border in front of them irregular. Sejugal border broad, with a pair of hollows medially, similar, but smaller one also present on *bo*. 2. Polygonal pattern and/or large alveoli well observable on all epimeres. Along discidium a longitudinal ridge present, directed to acetabula IV (Fig. 11). Setae 4c arising on posterior margin of discidium. Epimeral setae of normal size, setae 1c short, 3c, 4b longest of all. Genital setae arranged nearly in one longitudinal row. Position and shape of aggenital and anal setae, lyrifissures *iad* normal.

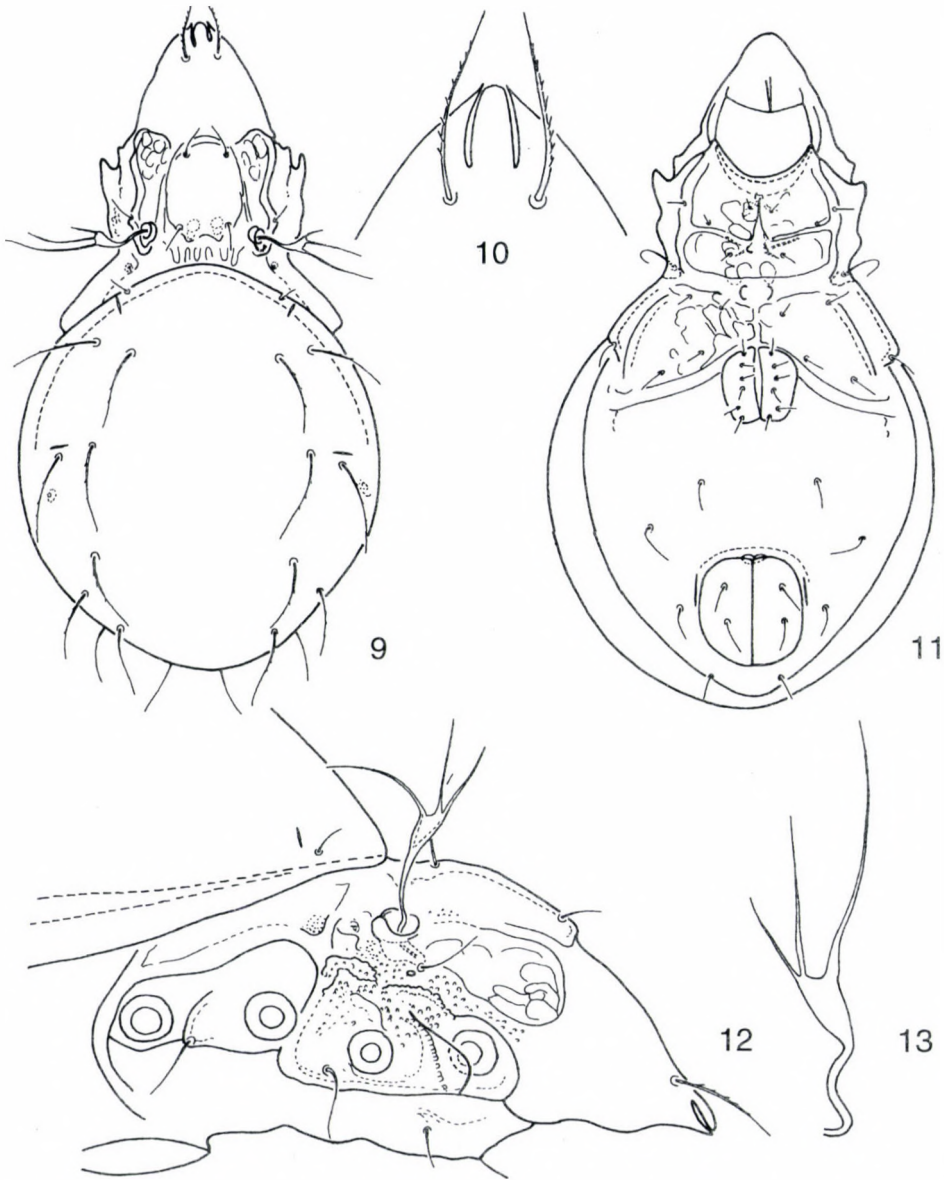
Legs: Articles of legs normal. No great difference among the setae of genua of leg IV. Setae *l'* of tibia shorter than *v'*, *v''* very short. Setae *v''* and *a''* of leg IV plumose.

Remarks: Main characters: obtuse, broad median rostral apex and the shape of lateral S-shaped costula.

Material examined: Holotype Uganda, Kabale District, Ichuya forest Reserve, S of Rwaburimba village, along the Kabales? Kisoro road above Kanaba Gap at 2400–2440 m alt. 1°14.9'S, 29°48.3'E. Bamboo *Sinarundinaria alpina*) forest, 10–12 m tall), 1997. leg. T. Pócs. 2 paratypes from the same sample. Holotype (1603–HO-98) and 1 paratype (1603–PO-98) (with identification

numbers of the specimens in the Collection of Arachnida) are deposited in the Hungarian Natural History Museum, Budapest, and 1 paratype in the Muséum d'Histoire naturelle, Genève.

Etymology: Named after the broad and blunt median rostral apex.

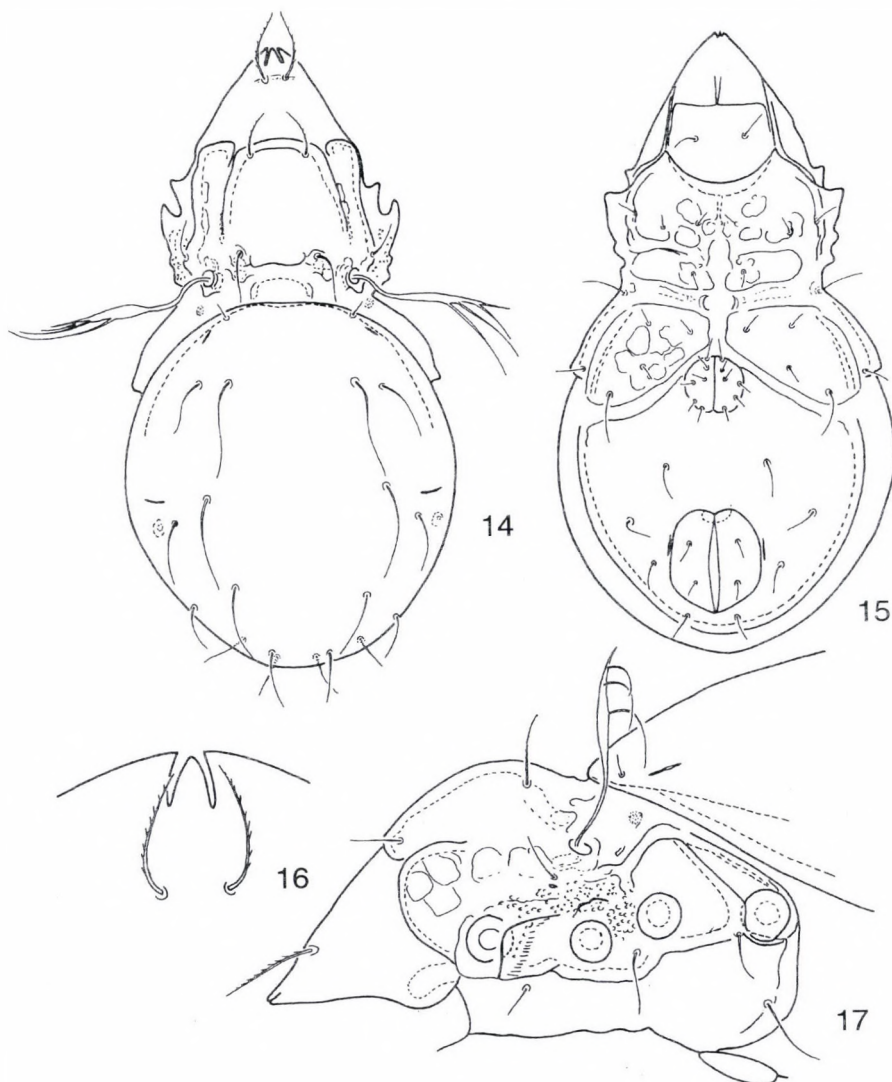


Figs 9–13. *Arcoppia (Arcoppia) obtusa* sp. n.: 9 = body in dorsal view, 10 = rostrum, 11 = body in ventral view, 12 = podosoma in lateral aspect, 13 = sensillus

***Arcoppia (Arcoppia) parasensillus* sp. n.**
(Figs 14–17)

Measurements – Length of body: 312–324 μm , width of body: 164–176 μm .

Prodorsum: Rostrum tripartite, all three apices equal in length, but median one broader than the two others. Incisions between them narrow, deep. Shape of costulae typical, the median, horse-shoe-shaped one conspicuously broad, its transverse part only slightly arched (Fig. 16). Its longitudinal parts long, well developed, directed to bothridia, but their basal part consisting of small



Figs 14–17. *Arcoppia (Arcoppia) parasensillus* sp. n.: 14 = body in dorsal view, 15 = body in ventral view, 16 = rostrum, 17 = prodorsum in lateral aspect

granules. S-shaped lateral costulae also strong, not projecting beyond the preceding median one anteriorly, running posteriorly. Their basal part thick, with some tubercles, one of them bearing the exobothridial setae. Interlamellar region with two pairs of sigillae, between them a transversal line (band) framing this region. Interbothridial region with one pair of indistinct tubercles medially. Cervical part of prodorsum with one pair of indistinct porose areae. Bothridia large with a pair of small, triangular posterior apophyses. Rostral setae arising medially, near to each other. They are much longer than interlamellar ones. Sensillus very long and large, its peduncle gradually broadened, spindle-shaped, with 3–4 conspicuously long and bent branches (Fig. 14).

Lateral part of podosoma: S-shaped lateral costula directed to acetabula of legs I. Position of the acetabula III clearly above the acetabula II or IV. Exobothridial region and a field between acetabula I, II and III well granulated. Pedotecta I small, pedotecta II–III absent, discidium well developed. An arched, strong lath observable beyond acetabula III and IV (Fig. 17).

Notogaster: Nearly round. Median part of dorsosejugal suture narrowed, slightly concave. Ten pairs of notogastral setae present, setae c_2 short, simple, all others much longer, some fine cilia hardly observable. Great differences exist in their lengths, setae la and lm arising along a transversal line, but la nearly half as long as lm , similar ratio is between setae lp and h_3 (Fig. 14). Setae p_1 , p_2 , and p_3 much shorter than la and h_3 .

Ventral parts of the body (Fig. 15): Epimeral borders and apodema mostly well developed and sclerotised. Among them $bo. 2$ short, indistinct, sternal border in front of them absent. Sejugal border broad, with bridge-shaped line medially. Polygonal pattern and/or large alveoli observable on all epimeres. Epimeres I and II framed laterally by arched ridges, setae lc arising on them. Along discidium the longitudinal ridge strong, reaching to acetabulum of leg IV (Fig. 15). Setae $4c$ arising on inner margin of discidium. Epimeral setae of normal size, setae lc short, $3c$, $4b$ longest of all. Genital setae arranged in two longitudinal lines, 1, 2, 3 and 6 located near to inner margin, 4 and 5 near to lateral one. Position of aggenital and anal setae normal.

Legs: No great difference between genual setae of leg IV. Solenidium of tibia IV very long and arched backwards. Setae l' and v' equal in length, v'' small and thin. Setae v''' and a'' of tarsus IV plumose.

Remarks: Particular features: the shape of the sensillus.

Material examined: Holotype Uganda, Kabale District, Ichuya forest Reserve, S of Rwaburimba village, along the Kabale? Kisoro road above Kanaba Gap at 2400–2440 m alt. $1^{\circ}14.9'S$, $29^{\circ}48.3'E$. Bamboo *Sinarundinaria alpina* forest, 10–12 m tall, 1997. leg. T. Pócs. 1 paratype from the same sample. Holotype (1604–HO-98) and 1 paratype (1604–PO-98) (with identification numbers of the specimens in the Collection of Arachnida) are deposited in the Hungarian Natural History Museum.

Etymology: Named after the peculiar form of the sensillus.

***Arcoppia (Arcoppia) piffli* sp. n.** (Figs 18–22)

Measurements – Length of body: 389–411 μ m, width of body: 197–224 μ m.

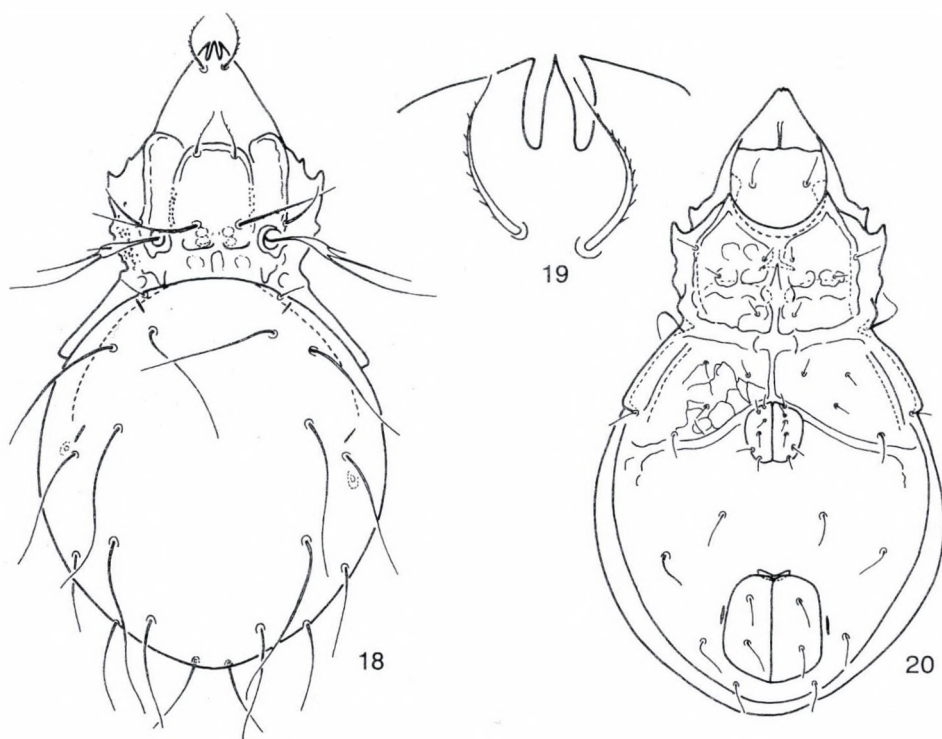
Prodorsum: Rostrum tripartite, all three apices nearly equal in length, incisions between them broad and deep (Fig. 19). Shape of costulae typical, the median, horseshoe-shaped broad, its transversal part arched (Fig. 18). Its longitudinal parts long, but their basal part represented only by granules, directed to the bothridia. S-shaped lateral costulae also strong, projecting beyond the preceding median one anteriorly, running posteriorly, behind bothridia. Their basal part thick, with some tubercles and bearing the exobothridial setae. Interlamellar region with two pairs of great and

round sigillae, behind them two arched, indistinct transversal lines present. Interbothridial region with one unpaired stronger median and one pair of indistinct lateral "tubercles". Cervical part of prodorsum with one pair of stronger apophyses connected to bothridia and one pair of indistinct porose areae also visible. Bothridia medium large, nearly quadrangular with a small, posterior apophysis. Rostral setae arising near to each other, medially. Interlamellar setae very long. Sensillus typical for the genus, medium long, with a distinct head bearing 3–4 branches. Two of the branches always very long, thin and curved.

Lateral part of podosoma: S-shaped lateral costula directed to acetabula of leg I. Position of acetabula III clearly above acetabula II or IV (Fig. 21). Exobothridial region and a field between acetabula I, II and III well granulated. Pedotecta I normal, pedotecta II–III absent, discidium well developed. No arched lath beyond acetabula III and IV.

Notogaster: Broad but elongate. Median part of dorsosejugal suture gradually narrowed. Ten pairs of notogastral setae present, setae *c*₂ short, simple, all others much longer, some fine cilia hardly observable. Setae *la* arising clearly in front of *lm*. Great difference exist in their length, setae *la*, *lm* and *h*₃ nearly equal in lengths, *lp* and *h*₂ the longest of all, S-shaped, flagellate (Fig. 18). Setae *p*₁, *p*₂, and *p*₃ much shorter than the others.

Ventral parts of the body (Fig. 20): Epimeral borders and apodema mostly well developed and sclerotised. Among them *bo*. 2 short, indistinct, sternal border in front of them partly absent. Sejugal border broad, this and median part of *bo*. 2, with bridge-shaped line medially. Polygonal pattern and/or large alveoli observable on all epimeres, especially on epimeres I. Epimeres I and II



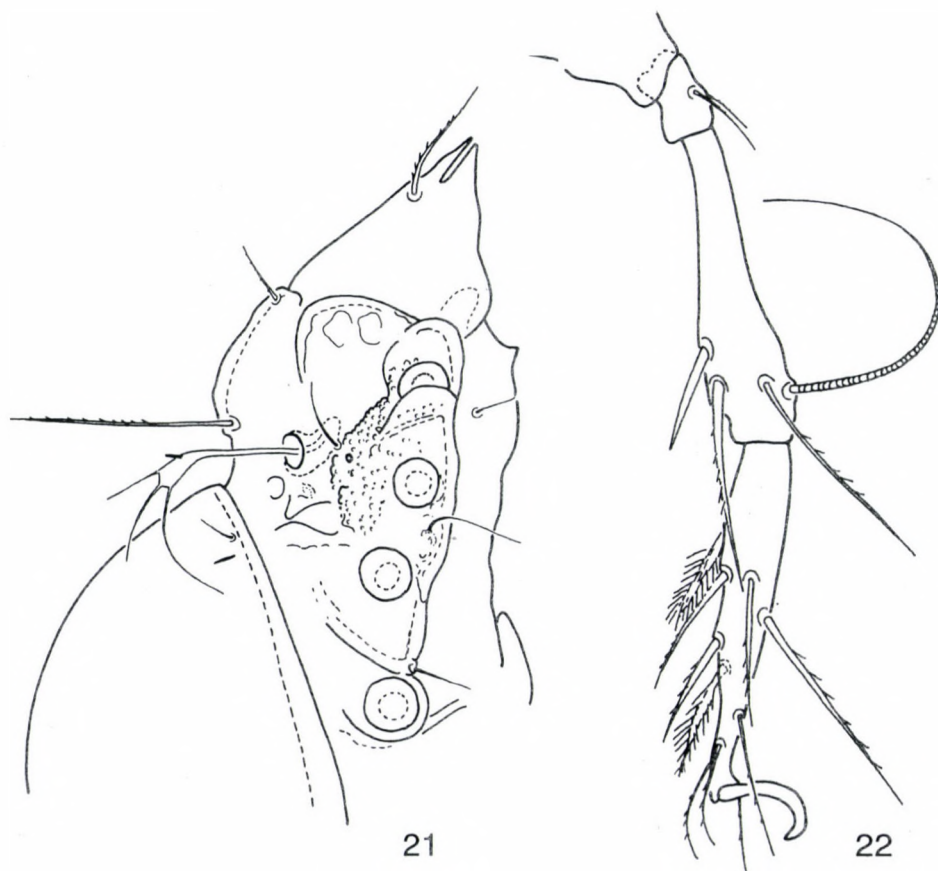
Figs 18–20. *Arcoppia (Arcoppia) piffli* sp. n.: 18 = body in dorsal view, 19 = rostrum, 20 = body in ventral view

framed laterally by arched ridges, setae *Ic* arising on them. Discidium rounded laterally, along them the longitudinal ridge long, directed to acetabula IV. Setae *4c* arising on inner margin of discidium, these and setae *Ic* short. Epimeral setae of normal size, *3c*, *4b* the longest of all. Genital setae arranged in two longitudinal lines, 1, 2, 3, 4 and 6 located near to inner margin, setae 5 near to lateral one. Position of aggenital and anal setae normal.

Legs: No great difference between the setae of genu IV. Solenidium of tibia IV conspicuously long, arched (Fig. 22). Great differences exist also among the tinal setae of leg IV. Setae *v'* comparatively long. Setae *v''* and *a''* of tarsus IV plumose.

Remarks: The species is well characterised by the broad rostral incisions and the long interlamellar setae.

Material examined: Holotype Uganda, Kabale District, Ichuya forest Reserve, S of Rwabu-Rimbe village, along the Kabales? Kisoro road above Kanaba Gap at 2400–2440 m alt. 1°14.9'S, 29°48.3'E. Bamboo *Sinarundinaria alpina* forest, 10–12 m tall), 1997. leg. T. Pócs. 4 paratypes from the same sample. Holotype (1605–HO-98) and 3 paratypes (1605–PO-98) (with identification



Figs 21–22. *Arcoppia (Arcoppia) piffli* sp. n.: 21 = podosoma in lateral aspect, 22 = leg IV

numbers of the specimens in the Collection of Arachnida) are deposited in the Hungarian Natural History Museum, Budapest, and 1 paratype in the Muséum d'Histoire naturelle, Genève.

Etymology: Dedicated to the memory of my recently deceased dear friend and teacher, Dr. EDUARD PIFFL, Vienna.

***Arcoppia (Arcoppia) secata* sp. n.**
(Figs 23–25)

Measurements – Length of body: 274 μm , width of body: 120 μm .

Prodorsum: Rostrum tripartite, incisions between the three parts broad, conspicuously, long. Median apex narrow, only hardly longer than lateral ones, obtuse (Fig. 19). Lateral apices sharply pointed. Shape of costulae typical, the median, horseshoe-shaped one broad, its transversal part waved (Fig. 23). Its longitudinal parts short, but directed to bothridia, in their median and basal parts composed of granules. S-shaped lateral costulae very strong, not projecting beyond transversal one. Their basal part thick bearing the exobothridial setae. Interlamellar region with two pairs of sigillae, behind them transversal line hardly observable. Interbothridial region with three pairs, partly indistinct laths or small tubercles medially. Sejugal region with one pair porose areae. Bothridia small, with a small posterior apophysis. Rostral setae arising medially, near to each other. They are much longer than lamellar ones. Latter also shorter than interlamellar setae. Sensillus (Fig. 25) with anteriorly narrowing, dilated, atypical head, bearing 4 long branches of different lengths.

Lateral part of podosoma: Lateral costulae framing an elongated, enclosed field and their lateral lines not reaching to the marginal line of acetabula I. Exobothridial region and fields between acetabula I, II and III granulated, by comparatively large granules. Some well sclerotised longitudinal crests also present. A porose area in the sejugal region present. Position of acetabula III and IV nearly same as acetabula I and II (Fig. 25). Pedotecta I small, discidium well developed. Setae *4c* arising on their posterolateral corner. An arched, strong lath running beyond acetabula III and IV.

Notogaster: Broad, ovoid. Median part of dorsosejugal line not narrowed, normal, gradually arched. Ten pairs of notogastral setae present, setae *c*₂ short, simple, all others much longer, finely roughened. Setae *lm* arising slightly in front of *la* (Fig. 23). Setae *p*₁, *p*₂, and *p*₃ only hardly shorter than the others.

Ventral parts of the body (Fig. 24): Epimeral region conspicuously well sclerotised, especially lateral borders thick, bearing short *3c* setae. Among the borders *bo*. 2 indistinct, sternal border in front of them irregular, but a sharp line on the mental tectum reaching posteriorly. Sejugal border broad, with a pair of hollows medially, similar, but smaller one also present on *bo*. 2. Polygonal pattern and/or large alveoli well observable on all epimeres. Along discidium a longitudinal ridge present, directed to acetabula IV. Setae *4c* arising on posterolateral corner of discidium. Epimeral setae of normal size, setae *1c* short, *3c* the longest of all. Anogenital setal formula typical. Genital setae arranged nearly in two longitudinal rows. Position and shape of aggenital and anal setae, and lyrifissures *iad* normal.

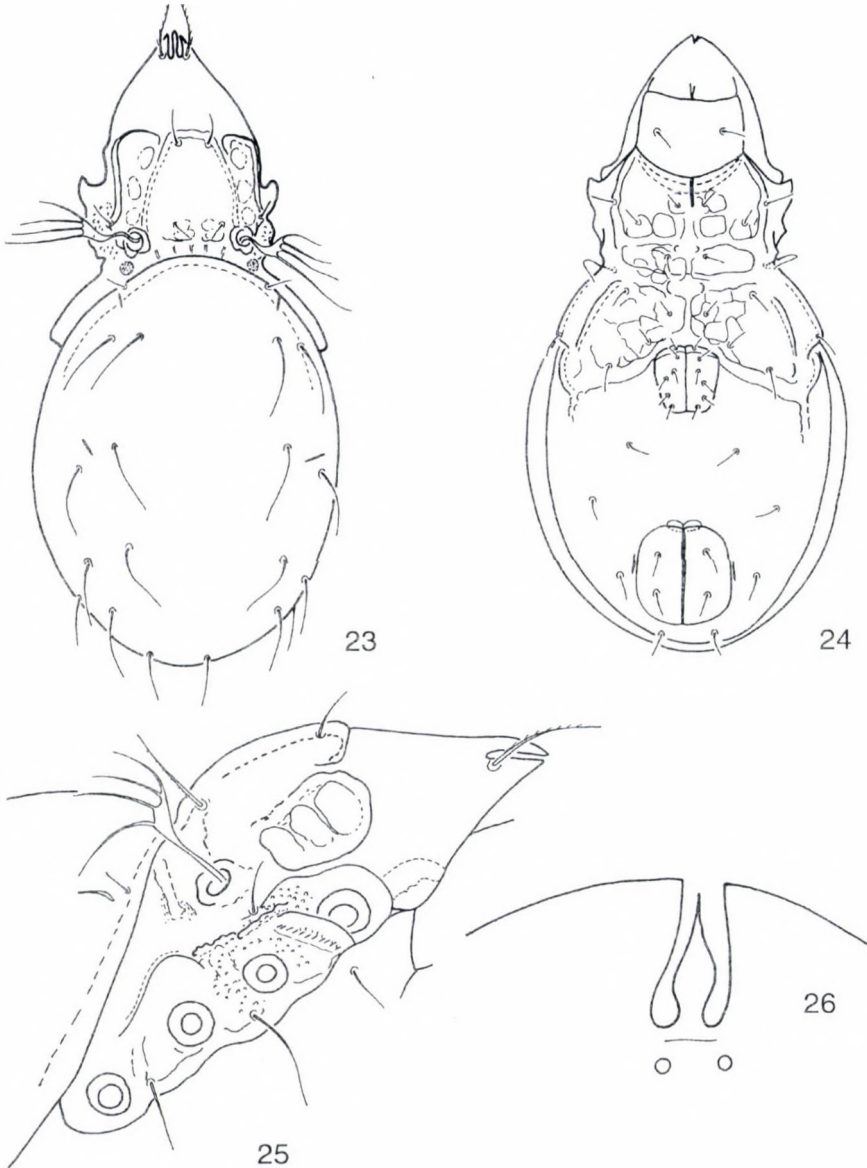
Legs: No great differences between genual setae of leg IV. Setae *l'* of tibia shorter than *v'*, *v''* very short. Solenidium of tibia IV very long and curved. Setae *v''* and *a''* of leg IV wide, plumose.

Remarks: The main characters are the shape of the lateral S-shaped costla and the form of the sensillus.

Material examined: Holotype Uganda, Kabale District, Ichuya forest Reserve, S of Rwaburimbe village, along the Kabales? Kisoro road above Kanaba Gap at 2400–2440 m alt. 1°14.9'S,

29°48.3'E. Bamboo (*Sinarundinaria alpina*) forest, 10–12 m tall), 1997. leg. T. Pócs. Holotype (1606–HO-98) (with identification numbers of the specimens in the Collection of Arachnida) are deposited in the Hungarian Natural History Museum, Budapest.

Etymology: Named after the shape of the rostrum.



Figs 23–26. *Arcoppia* (*Arcoppia*) *secata* sp. n.: 23 = body in dorsal view, 24 = body in ventral view, 25 = podosoma in lateral aspect. 26 = *Arcoppia* (*Wallworkoppia*) *trimucronata* (WALLWORK, 1961) rostrum

Arcoppia (Wallworkoppia) machadoi (BALOGH, 1958)
(Figs 27–30)

Measurements – Length of body: 257–274 μm , width of body: 123–135 μm . I found significant differences in size among the various populations.

Prodorsum: Rostrum tripartite, but median apex clearly shorter than lateral ones, blunt at tip, incisions among them deep (Fig. 28). Shape of costulae atypical, the median, horseshoe-shaped one broad, its transversal part nearly straight, not protruding beyond lateral ones (Fig. 27). Its longitudinal parts very short, only a small part visible as lath running posteriorly, other part consisting only of granules, arranged in rows, reaching to bothridia. S-shaped lateral costulae much stronger, broadly arched anteriorly running posteriorly to bothridia, bearing the short exobothridial setae. Interlamellar region with two pairs of round sigillae, behind them a waved transversal line present. Interbothridial region with one pair of indistinct “tubercles”. Sejugal region with one pair of distinct porose areas. Bothridia small, nearly round with small, posterior apophysis. Rostral setae arising in normal position. Lamellar and interlamellar setae short, much shorter than rostral ones. Sensillus pectinate, without distinct head, bearing 6 branches (Fig. 30) of different length.

Lateral part of podosoma: Position of acetabula III and IV clearly above acetabula I and II (Fig. 30). Exobothridial region and a field between acetabula I and II well granulated with small granules. An additional setal alveoli, located very near to the alveoli of exobothridial setae present. Pedotecta I normal, discidium well developed. An arched lath beyond acetabula III and IV.

Notogaster: Narrow and elongate. Median part of dorsosejugal line normal. Ten pairs of notogastral setae present, setae c_2 short, simple, all others much longer, some fine cilia hardly observable. Setae la arising clearly in front of lm . No great differences exist in length of setae, but setae p_1 , p_2 , and p_3 shorter than the others.

Ventral parts of the body (Fig. 29): Epimeral borders and apodema mostly well developed and sclerotised, sternal ones also well observable. Among the others $bo. 2$ short, indistinct, the sternal border in front of them partly absent. Sejugal border broad, bridge-shaped lines on them and on median part of $bo. 2$ present. Polygonal pattern and/or large alveoli observable on all epimeres, especially large alveoli on epimeres I and polygonal pattern on epimeres IV. Epimeres I and II framed laterally by arched ridges, setae $1c$ arising on them. Along discidium a long, longitudinal ridge present, directed to acetabula IV. Setae $4c$ arising on inner margin of discidium. Epimeral setal formula: 3 – 1 – 3 – 3. Epimeral setae of normal size, setiform, simple and smooth. Setae $3c$, $4b$ the longest of all. Genital setae arranged in one longitudinal line. Position of aggenital and anal setae normal (Fig. 29), these setae similar to epimeral ones.

Legs: Setae of genua IV nearly equal in length. Great differences exist among the tibial setae of leg IV. Setae v'' and a'' of leg IV plumose.

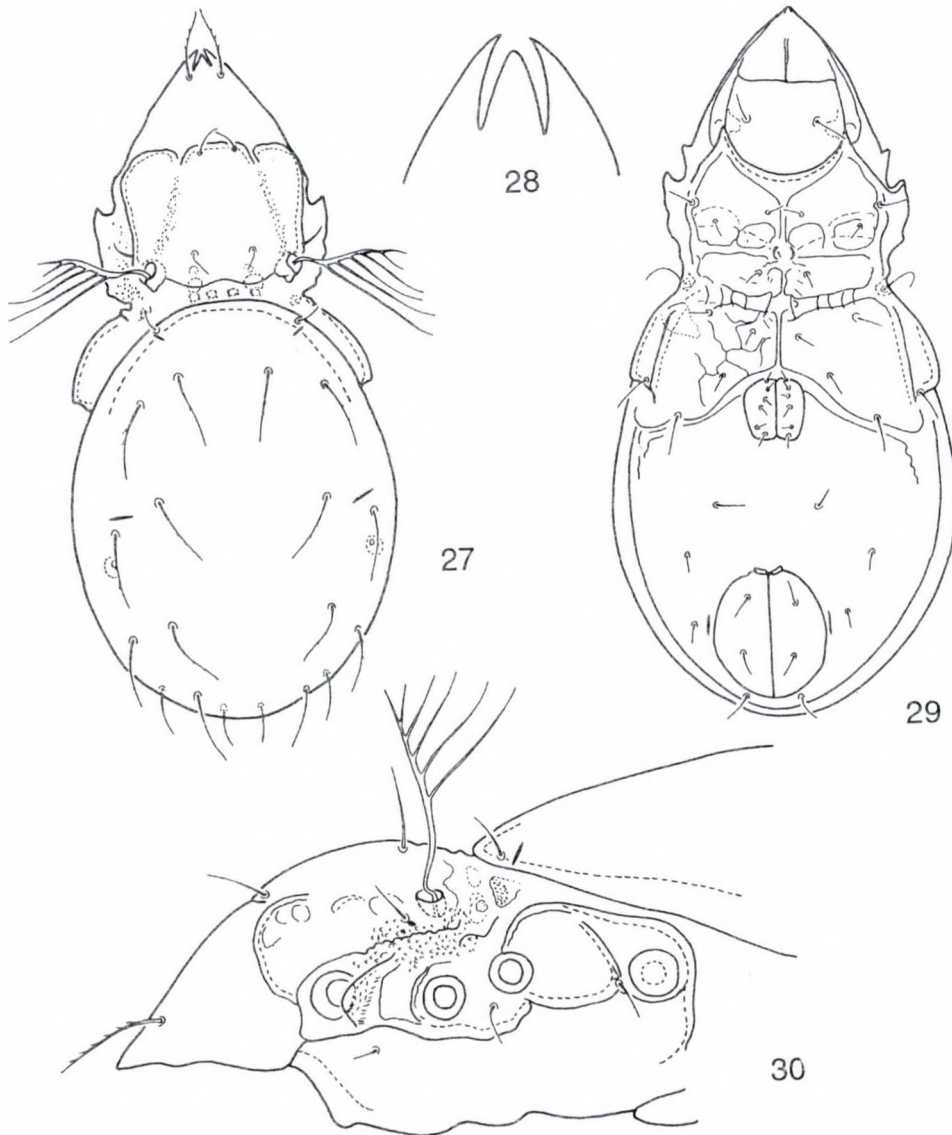
Material examined: Uganda, Kabale District, Ichuya forest Reserve, S of Rwabu-Rimbe village, along the Kabales? Kisoro road above Kanaba Gap at 2400–2440 m alt. 1 14.9°S, 29 48.3°E. Bamboo *Sinarundinaria alpina* forest, 10–12 m tall, 1997. leg. T. Pócs.

Arcoppia (Wallworkoppia) trimucronata WALLWORK, 1961
(Fig. 26)

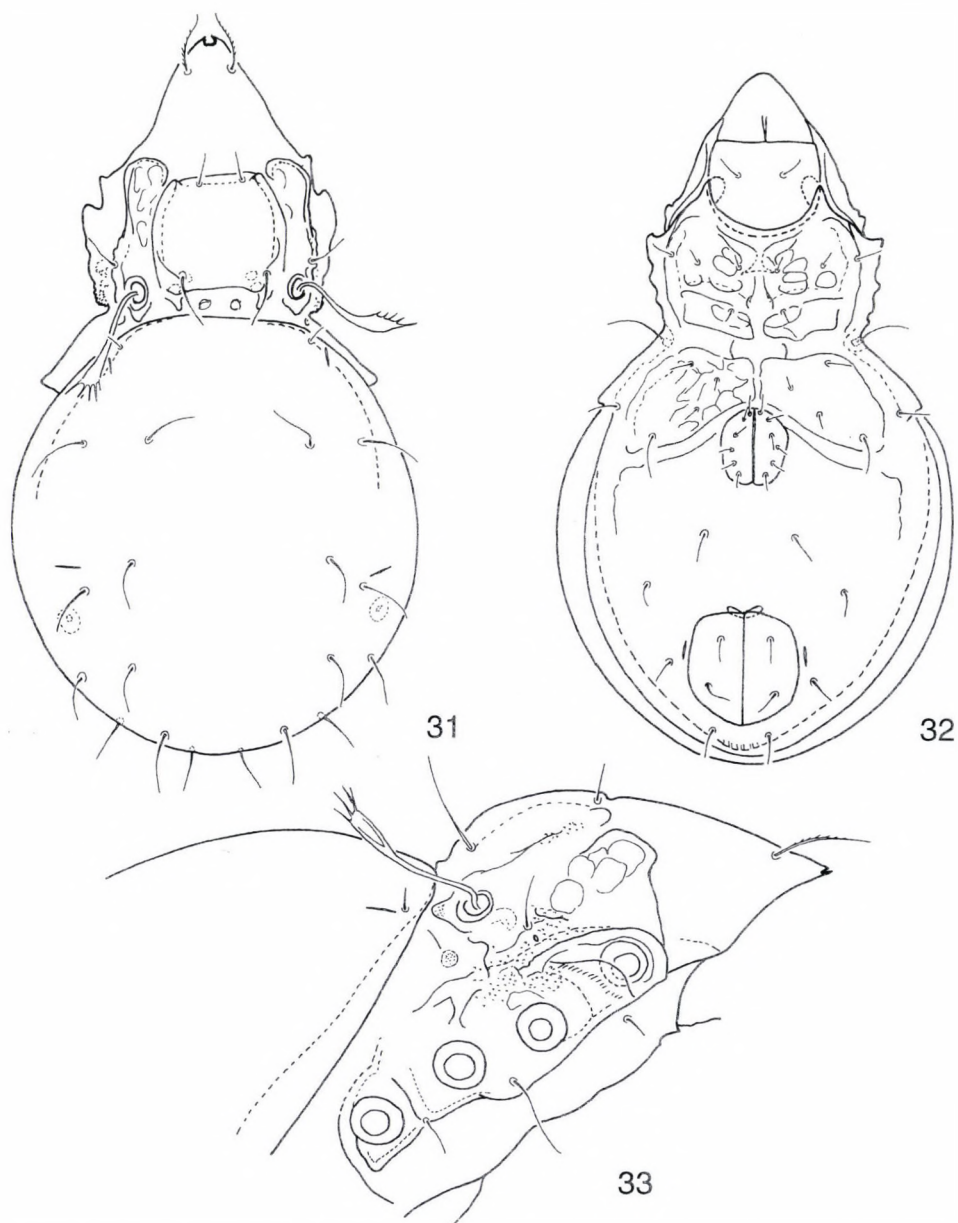
Several years ago J. A. WALLWORK kindly sent to Prof. J. BALOGH some oppiids from Ghana. Among them were two specimens which are surely identical with this species, although some minor differences exist between them and the description and figures given by the author. The subsequent remarks are based on my recent examinations.

Rostrum tripartite, incisive basally dilated, median apex shaped like an onion sharply pointed (Fig. 26).

Material examined: Uganda, Kabale District, Ichuya forest Reserve, S of Rwabu-Rimbe village, along the Kabales? Kisoro road above Kanaba Gap at 2400–2440 m alt. 1°14.9'S, 29°48.3'E. Bamboo (*Sinarundinaria alpina*) forest, 10–12 m tall), 1997. leg. T. Pócs.



Figs 27–30. *Arcoppian* (*Wallworkoppia*) *machadoi* (BALOGH, 1958): 27 = body in dorsal view, 28 = rostrum, 29 = body in ventral view, 30 = podosoma in lateral aspect



Figs 31–33. *Basidoppia (Basidoppia) angolensis* (BALOGH, 1958) – 31 = body in dorsal view, 32 = body in ventral view, 33 = podosoma in lateral aspect

Basidoppia (Basidoppia) angolensis (BALOGH, 1958)
(Figs 31–33)

Measurements – Length of body: 290–329 µm, width of body: 156–184 µm.

Prodorsum: Rostrum deeply excavated medially, this incision broad, U-shaped, median apex absent. Among costulae the median, horseshoe-shaped one broad, its transverse part nearly straight, with a small lateral tubercle on each side (Fig. 31). Its longitudinal parts long, well developed, reaching to inner margin of bothridia. S-shaped lateral costulae also strong, projecting beyond median one anteriorly and running posteriorly behind bothridia. Their basal part thick, with some tubercles, one of them bearing the exobothridial setae. Interlamellar region with two pairs of sigillae, behind them an arched transversal line framing this region. Interbothridial region with one pair of stronger "tubercles" laterally and 1–2 pairs of weak and indistinct rounded thickenings. Dorsosejugal region with one pair of indistinct porose areas. Bothridia a large with strong posterior apophysis. Rostral setae arising laterally, far from each other, nearly as long as interlamellar ones. Peduncle of sensilli long, its head clavate, comparatively short, with 2–5 conspicuously short branches, bifurcate form may also occur.

Lateral part of podosoma: S-shaped lateral costula directed to acetabula. Position of acetabula III slightly above acetabula II or IV (Fig. 33). Exobothridial region and a field between acetabula I and II well granulated. A well developed longitudinal ribs also observable. Pedotecta I small, discidium well developed and a parallel lath running posteriorly along them.

Notogaster: Comparatively round. Median part of dorsosejugal line thinning out. Ten pairs of notogastral setae present, setae c_2 short, simple, all others equal in length, not especially long (Fig. 31) bearing only some fine cilia observable on them. Setae la and lm arising in a transversal line.

Ventral parts of the body (Fig. 32): Epimeral borders and apodema well developed, $bo. 2$ with large alveoli, in front of them sternal apodema and border indistinct. Epimeres I and II well framed laterally by sclerotised ridges, setae $1c$ arising on them. Epimeres III and IV normal. Discidium long, its posterolateral cornes triangular. Along discidium the longitudinal ridge well developed (Fig. 32). Epimeral setae of normal size, setae $1c$, $3c$, $4b$ and $4c$ slightly ciliate, all others nearly smooth. Setae $3c$, and $4b$ longer than the others. Position and form of aggenital, anal and adanal setae normal.

Legs: No essential difference between the setae of genu IV. Solenidium of tibia IV simply arched. Setae v'' and a'' of tarsus IV plumose.

Material examined: Uganda, Kabale District, Ichuya forest Reserve, S of Rwabu-Rimbe village, along the Kabale–Kisoro road above Kanaba Gap at 2400–2440 m alt. 1°14.9'S, 29°48.3'E. Bamboo *Sinarundinaria alpina* forest, 10–12 m tall), 1997. leg. T. Pócs.

*

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A GENERAL DATA MODEL FOR DATABASES IN EXPERIMENTAL ANIMAL ECOLOGY

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Project-independent storage of data increases compatibility and comparability of ecological data-sets across studies. Here a data model is presented which describes a general data structure that can hold information from diverse animal ecological studies. The data model structurally reflects the three main aspects of ecological data sets by having modules for the biological object, the circumstances of the study and the results. Circumstances of a study include two modules: a module about project description and another about the sampling event. The Project module describes the project itself, the experimental design, and the properties of the study location. Details of data acquisition, including methodology, and any variables that change between sampling events are coded in the Sample module. The quantitative outcome of the study is handled in the Results module. Results are obtained from the evaluation of samples. Evaluation consists of classifying animals into homogenous groups, the 'lots', and recording relevant properties (response variables) of these lots. The Taxon module stores the main criteria of classifying animals into lots, their taxonomical identity. The logical data model expands these main modules by explaining their structure, giving the rationale for grouping data in a given way, and emphasising how data entities can be used flexibly in various research projects.

Key words: data model, database, animal ecology, sampling, experimental design, bio-informatics

INTRODUCTION

The main aim of synzoological research is to acquire information about the spatio-temporal patterns of animals. Such studies are carried out on many objects, and at various spatial and temporal scales and resolutions (WIENS 1989, JUHÁSZ-NAGY 1992). Information originating from diverse projects can be projected into a common data structure (ERIN 1994, BERENDSOHN *et al.* 1996), which consists of three basic data groups: data about a) the biological object; b) the circumstances of the study and c) the results. The common data structure can make project-independent storage of data possible, which enhances compatibility between data sets of various origin.

The algorithm for defining how data should be structured in a database, is called the data model (HALASSY 1994). Data objects (entities), their attributes and relationships are defined in the data model. To exploit the inherent structural similarity in synzoological data, transparency of databases containing them is

necessary. The publication of data models makes the development of new databases easy, because "off-the-shelf" solutions can be applied, and the design can be made, so that the greatest possible extent of compatibility is achieved. There is already a number of different ready-made databases and available data models. Most of them serve taxonomical purposes, and some helps handling specimen collections (LINDBERG 1996, COLWELL 1997). Other data models can also incorporate faunistical and floristical data (COLWELL 1997, COPP 1998). However, the use of these databases and data sets in many areas of experimental and applied animal ecology is very limited. These models are insufficient in treating data arising from various experimental or observational situations, i.e. treatments, blocks, exact details of methodology, variables that change with time, and many other specific data types.

In this paper a data model is presented, which has a general and flexible structure, is project-based, and is capable of handling data from a wide variety of animal ecological studies. This data model has been implemented, and successfully used for five years in a Hungarian nation-wide faunistical survey of spiders in agricultural habitats. The survey consisted of numerous sub-projects, where data of varying quality had to be handled (e.g. faunistical, quantitative, from planned agricultural experiments, life history studies etc.). To date, the database holds data on about 70000 individuals (385 species), collected in 8200 sampling units, and it has proved to be sufficiently structured to successfully provide a wide range query outputs.

THE LOGICAL DATA MODEL OF ECOLOGICAL EXPERIMENTS AND QUANTITATIVE STUDIES

Basic structure

The data model structurally reflects the three main aspects of ecological data sets by having modules for the biological object, the circumstances of the study and the results. It is easier to overview the structure of the data model if the circumstances are further divided into two modules (Fig. 1). The *Project module* describes background circumstances, such as the aims, location, experimental design and methods of the study and also the less variable properties of observational or experimental units, such as the locality or habitat type of a given experimental block. The second circumstantial module is called the *Sample module*, which describes all variable information relevant to the data collecting event, such as date, collector, weather, phenological state, and any other variable that can vary relative to the fixed project design. The *Taxon module* deals with the identity of the biological object. The quantitative outcome of the study is handled in the *Results module*. Collected animals get an identification tag (a species code)

from the Taxon module, while abundance information is stored in the Results module. It is also possible to keep track of individual based studies by storing various information about sets of studied specimens.

The structural data model (Fig. 2) expands each module, by giving details of their structure. The structure of the data model is built from data entities (tables) which have attributes (fields). Relationships between the entities in the present data model are all of the "one-to-many" type. There are attributes that can take any value, like a free text "Habitat description", while other attributes can only have certain values, that can be chosen from a list or code table. For the latter, the attribute "Habitat type" would be an example, which could be chosen from a list of predefined habitat categories. Databases are the more reliable, the less they trust on free naming of things by those who enter the data. There are logistical and other constraints on what kind of information can be included in a code table, and this decision has to be made at the implementation stage. For the present data model it is only suggested which entity should be a code table (Fig. 2) or which attributes should obtain their values from further code tables (Appen-

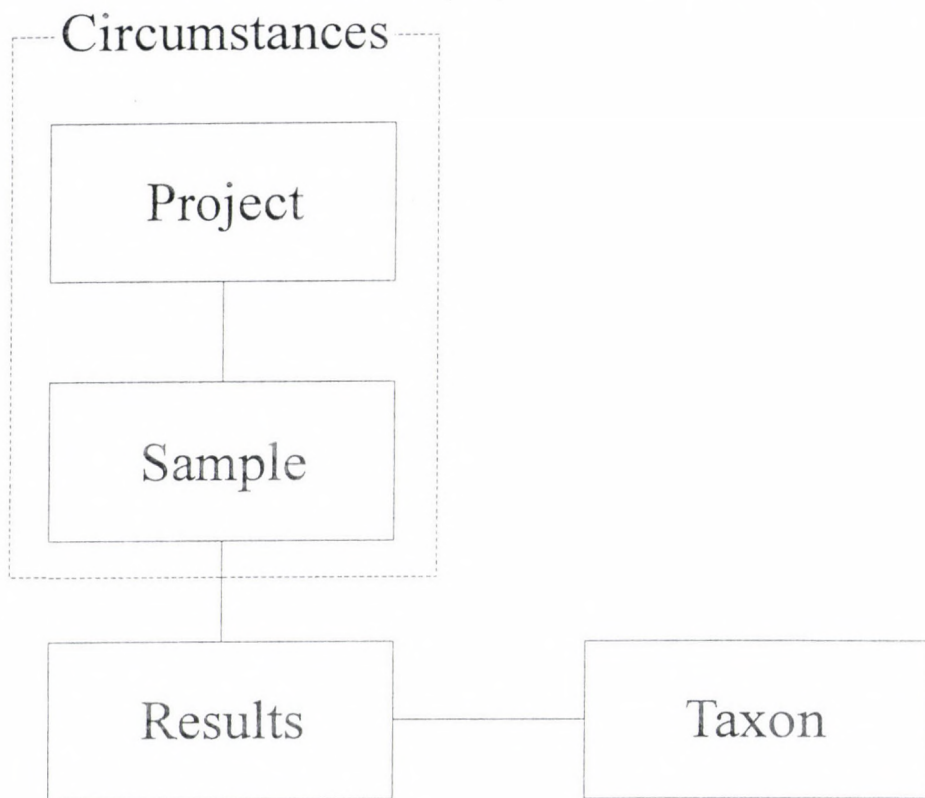


Fig. 1. The structural outline of the data model: relationship between the main data modules

dix). The logical data model is outlined below, by discussing the main entities giving the rationale for grouping data in a given way and emphasising how data entities can be used flexibly in various research projects.

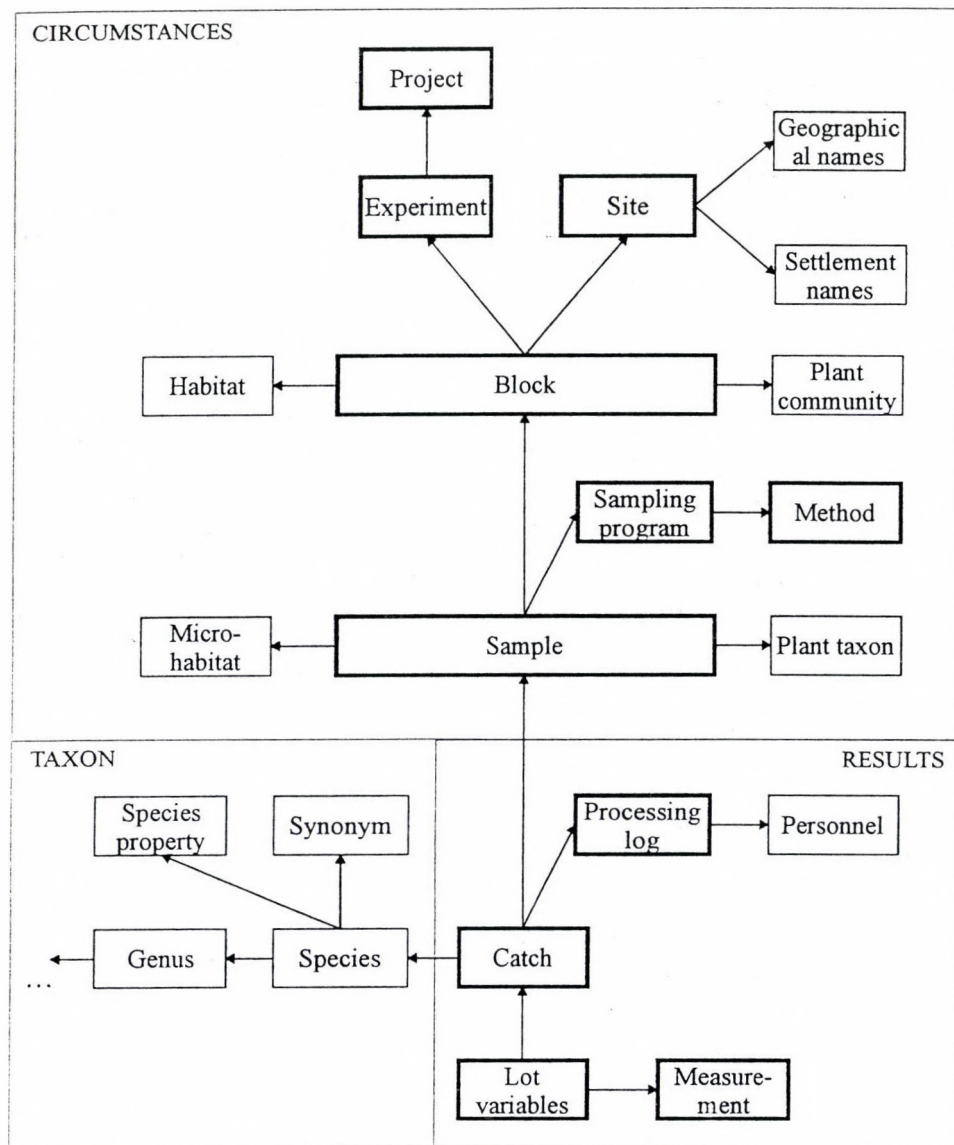


Fig. 2. The detailed structural plan of the data model. Main data entities are in bold, code tables are in plain style. The arrows indicate the relationship between entities, which are all of 'one-to-many' type, the arrow head pointing towards the 'one' side

Project

The Project entity helps to organise and functionally link data sets that originate from numerous surveys, experiments, etc. Information that can promote registration in a meta database can be stored here. The attributes listed in the Appendix reflect the metadata requirement set in the Hungarian National Biodiversity Monitoring System (HORVÁTH *et al.* 1997b).

The Experiment entity can hold general information about smaller units of a project, that constitute a planned collection of ecological data, carried out with pre-decided and defined methods, at fixed locations (blocks). Many types of quantitative studies can be handled as an experiment, even if there are no manipulative treatments in the strict sense. The Experiment entity stores descriptive information on the aims, methods objects and design of an experiment in its broadest sense.

Site

It is necessary to name and describe where a collection was made, or where blocks of an experiment are situated. The Site entity keeps record of this locality information. A single experiment can be carried out in blocks situated at a number of sites, and at a certain site there might be many blocks (not necessarily belonging to the same experiment). One could define a site as an area that is from the point of view of the given project, more or less homogenous (e.g. regarding some background variables), or in which blocks differ from each other by some finer details (random variation between blocks), and/or in treatment variables which could be manipulated by the experimenter. From this, it follows that the area of sites can be variable, and it depends on how the study objects or the experimenter's questions scale the environment (ADDICOTT 1987, WIENS 1989). Nevertheless, it might be useful if a site is a natural landscape unit, such as a field, a meadow, a hill, a forest parcel, etc.

Sites are named uniquely by the user. Their geographical location, extent and topographical description has to be given in the Site entity. Naming conventions are discussed in detail by DÉVAI *et al.* (1987). They propose the inclusion of settlement names into site names for all sites within the administrative borders of a given settlement. Settlement and standard geographical names are ideally obtained from code tables. Geographical location and extent of sites can be given with various degrees of precision. Co-ordinates can be read from GPS equipment, or reference can be given for a map. The technique and the precision for obtaining the reading should be recorded for each method used. The area of the site can be estimated as a mean diameter, or given as the corner co-ordinates of the bounding rectangle (FGDC 1998).

Block

Experiments are carried out in blocks. The block is the unit, which is (from the experiment's point of view) homogeneous in most respects. It can be regarded that variables that might differ randomly between blocks, have the same value within a block. Blocks are also the units to which treatments are applied. These will be independent variables, while the values of the dependent or response variables are obtained by sampling from the block. Spatial replication of blocks makes it unnecessary to know about all factors that might cause a random variation in the experimental area (HURLBERT 1984, UNDERWOOD 1997). To obtain satisfactory estimates of the response variables sampling can be carried out on multiple occasions, in replications, and with multiple methods within a single block.

When describing the block, in addition to the treatment variables, one can specify basic attributes such as habitat type, plant community and soil classification. Description can use measured, continuous variables, such as soil pH. Where variables change in time (e.g. the water table level), and where this change is relevant to the experiment, coding should be in the Sample entity.

Blocks are useful data objects not only for the classical experimental approach but also in other applications. If the study is observational, or of survey type, it is useful to think of the Block entity as a habitat patch. Using the Block object flexibly makes the data model capable of storing data from simple faunistic collecting, sophisticated ecological surveys, and complicated field experiments. If we want to know the species composition and seasonal dynamics at a given site, it is enough to define only one block in the design. Blocks can be defined in time, as well, but in such cases time is not treated as a continuous variable, but as a categorical one. For instance, in an orchard a pesticide is applied after a certain date. Then blocks could be defined, one set for 'before pesticide use' the other for 'after pesticide use'. Blocks can also be defined for easily classifiable, discrete natural differences between habitat patches, such as plant communities or crops, if a comparative study has to be performed. Blocks can be set up on the basis of continuous differences, as in the case of gradient analysis. Ecological studies are often done in transects or grids. In that case every sampling location needs to be coded as a separate block, using the block location attribute.

Sampling

In ecological studies the response variables are usually some kind of abundance values of the sampled population. Abundance estimates are dependent to a great extent on the sampling method, protocol or physical equipment used (SOUTHWOOD 1978). These attributes of sampling are coded in the Sampling program entity. Carrying out a sampling program produces one sample in a block on each sampling occasion. Information on a sample is saved in the Sample entity.

Sampling is usually done by a widely-used method, such as pitfall trapping or sweep netting. More than one method, and therefore sampling program, can be applied parallel in a block. A sampling program is the algorithm, how a method was used for sampling. This consists of two types of information, the technical details of the method, and the quantitative aspects of its use. Technical information is stored separately in the Method entity. In the Method entity attributes such as type, size, and parameters of the equipment can be given, plus other technical information, such as what preservative or bait material was used.

Quantitative parameters of a sampling program include the following: Sample size indicates the number of replicates (= number of subsamples) applied in a block. Sample size can be, for instance, the number of pitfalls used in a block. The contents of each pitfall then constitutes a subsample. Subsamples are the physical units that are stored in one container, together with a label. The sampling effort is a property of the subsample. For example in sweep netting sampling effort defines the number of sweeps per collecting bag. Duration of the sampling (with continuous methods such as pitfalls and light traps) indicates time elapsed between consecutive collections.

Information about block, sampling program used, date, collector, and variables that change between sampling occasions are organised in the Sample entity. Variables that might change with time can be independent variables, such as weather or phenology of the vegetation. They can describe unique circumstances of sampling, like species of host animal, host plant, microhabitat, etc. Host plant of pollinating insects, for instance, cannot be pre-set in the Block entity, because the availability of flowering herbs changes with season, therefore has to be coded in the Sample entity. The third group of variables that can change in time are the quantitative parameters of the sample. These parameters are double coded here, because they are represented in the Sampling program entity, as well. The reason for this, is that it varies in different experiments how constant these parameters can be kept. In a concrete implementation it can be suggested that, if a parameter is fairly constant, then that can be given in the Sampling program table. This would be the case with sampling effort in sweep netting, since one can nearly always keep to the pre-decided number of sweeps. Sample size in pitfall trapping, on the other hand, is safer to be coded in the Sample table, because rodents, flooding, etc. often alters the pre-decided sample size. In practice the final value of double-coded parameters can be obtained by multiplying the two values. In the pitfall example that would mean, that 1 is entered as sample size in the Sampling program table, and the actual value in the Sample table, then their multiplied value will give the true sample size.

Catch and lot variables

The data model makes it possible to store information on homogenous groups of animals, or 'lots', in the Results module. In evaluating a subsample, the animals caught are classified to create these lots, then some variables, which are usually the dependent variables of the experiment, are recorded for each lot. The Catch entity stores the result of this classification and evaluation process. The Lot variables entity is an extension to the Catch entity, which makes it possible to store not only abundance type but any user-defined response variables (e.g. on behavioural, morphometric or reproductive data) for each lot, including the possibility that a lot is as small as a single specimen. Definition of user-defined variables, and methodology of obtaining their values, i.e. how they were measured, is given in the Measurement entity.

The classification of animals into lots is based on taxonomical identification, and sorting into sex, stage, age, size-class, or other custom groups (e.g. reproductive, or parasitisation state). Catch in the simplest case is the number of individuals in a lot. Depending on the nature of the study objects, the catch attribute is also capable of storing other types of abundance data. Data type is separately given for each lot. It can be an estimated value (e.g. number of individuals in an aphid colony), class or category type (e.g. strength of swarming on a scale from 0 to 5), or binary presence-absence type. It is also important to make a distinction between zero catch (e.g. no catch in a pitfall) and missing values, which one gets if trap material is lost. Additional information about processing the subsamples is given in a separate Processing log entity, and includes state and reliability of taxonomical identification, the person who made the identification, and by whom and when data entry was made.

The combination of Catch and Lot variables is a very flexible means for storing information originating from various projects. For instance, let us examine a rather specific (hypothetical) problem, the preferred oviposition sites of lacewings on the leaves of two plant species. We can define six blocks, which will be individual shrubs, three of each species (treatment variable is shrub species). On each shrub ten randomly chosen leaves are examined (sample size=10). In each subsample (i.e. on each leaf) there will be a variable number of lacewing eggs. Because we are interested in the spatial patterning of the eggs, we take each egg as a lot (catch=1). In the Lot variables table, which is connected to Catch through LotID, we can define variables such as i) whether the egg is laid on the upper or lower surface of the leaf, ii) position of the egg as percent distance between central vein and edge, and iii) the distance of the egg from its nearest neighbour. Data stored in this structure will make it possible to study oviposition preferences in relation to plant species, and any differences in the oviposition pattern that might exist between host plants.

Taxon

The main component of the classification of study objects into lots is taxonomical identification. As a result of the identification, a taxonomic name or category is attached to the lot. Regarding the present data model the Species and higher taxa entities function as code tables. Higher taxa represents entities (Genus, Family, Order, etc), which are taxonomic levels of relevance. Unfortunately, the reality is that such ready-made code tables, especially for the lower taxonomic levels, are often not available, and have to be created by the investigator. Regarding the function and usage of Species one task is to keep the taxonomic names current. This involves keeping a record of synonyms, and following other taxonomic changes, which is made possible through the Synonym entity. For such purposes taxonomic database applications (e.g. COLWELL 1997) can also be used, and an unchangeable SpeciesID (or a GuestID) can be a link between that application and a Species table implemented from the present data model. Recording higher taxon can be of practical importance if experimental results need to be combined by higher level groups. To create such groups based on any criteria required, various information about species can be stored in the Species property entity. Most of these are user-defined variables, such as size, mass, phenology, guild, life form, biogeographical class, rarity, ecological and conservation status.

Another requirement of the Species entity is, that it should be able to identify lots that are identified to different taxonomic levels. For instance juvenile spiders can be identified to genus, or sometimes only to family level. The solution to the problem is that the lowest level key, SpeciesID should, contain codes for all levels. To follow the spider example, if a first instar spider can only be identified as Lycosidae sp. (which is the family level), then it gets a unique code, with "Lycosidae sp." in the Species name field. Species table is linked to Genus table through GenusID, which is a unique identifier for a dummy genus (an empty string is entered at the Genus name field of the Genus table). This dummy genus has a link to the Lycosidae family in the Family table. Different levels of classification can be, in general, a problem in ecological projects. There can be multiple levels in many code tables (e.g. habitat, guild, and geographical name). In these cases the solution can be to use a similar structuring of code tables as the one described above.

PROSPECTS

The basically similar data structure makes it possible to store results from various projects in a project-independent way, with the maximum possible elements stored in a standardised format. Most importantly, using a uniform data

structure makes data self-compatible, that is data sets created by the same investigator or research group will be compatible and directly comparable with each other. Compatibility with data sets originating from other research groups has the benefit of making a study more complete, since in ecology individual investigators are limited in space and time, and in their taxonomic specialisation. The International and USA Long Term Ecological Research (LTER) network (STRAYER *et al.* 1986) has based its research strategy on this additivity of individual ecological projects. This requires stringent data management, which is based on the collection of data and providing metadata according to strict detailed standards (MICHENER *et al.* 1997). The ongoing integration of Hungarian ecological research will help in the adaptation process of data standards. Nationwide projects, such as the National Park Surveys, the establishment of Hungarian LTER sites, and the initiation of a National Biodiversity Monitoring System (NBMS) (HORVÁTH *et al.* 1997a) will advance this process. The first step was, that a Hungarian metadata standard was designed in the framework of NBMS. The compilation of some important code tables, such as that of the Hungarian flora (HORVÁTH *et al.* 1995), habitats (FEKETE *et al.* 1997) and plant communities (KOVÁCSNÉ LÁNG & TÖRÖK 1997) are already accomplished. Zoo-taxonomical databases exist for dragonflies (DÉVAI *et al.* 1994), spiders (SAMU & SZINETÁR 1999) and vertebrate groups (BÁLDI *et al.* 1995). These achievements will promote compatibility among databases and for cataloguing existing data sets.

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APPENDIX

Plan of a database based on the logical data model. The structure of code tables, except for those in the Taxon module, are not detailed here.

Example

In the "example" column we give a real life example of what values can be stored in the specific fields. In short, the example is taken from a project, where the effect of vegetation structure was studied on spiders. In an experiment we had 6 blocks of alfalfa, which received the treatments. Three blocks were mowed in a way, that unmown stripes were left (strip mowing), the three other blocks were mown completely (normal mowing). Two sampling programs were run: pitfall trapping and suction sampling. The example gives all data that is stored in the database in connection with the final data unit, the catch of the lot of 1 male *Pardosa agrestis* wolf spider individual, in a certain trap, at a certain date. Since, we were interested in some life history parameters of the population, morphometric measurements were also done on the spider individual.

Legends

Underlined, bold: key, unique identifier of a table

Underlined: connecting field to a key in parent table (the table on the many side of the relationship).

*: recommended to obtain its values from a standardised code table, i.e. standardised for a greater research community.

***: recommended to obtain its values from a code table defined by the user, i.e. standardised for a smaller research community, e.g. research group.

Data types: n = numeric; c = character; l = logical; d = date/time, t = free text.

Field name 1...n: Repeatability. A field can be repeated a specified or unspecified number of times in the table, so as to a) link several fields of the same type to a child table, b) express different level of content of the same data type. For example Habitat1 stores larger scale habitat classification, habitat2 the finer classification, or Coordinate1 stores degree, Coordinate2 minute, Coordinate3 second; c) give free choice, how many variables are used to describe a data object.

PROJECT TABLE

field name	type	description	example	connection in parent table
<u>ProjectID</u>	n	project identifier	17	
Project short name	c	short, informative name	StripManage	
Project long name	c	full project name	Strip management in alfalfa	
Project summary	t	free text description	In the project we aimed to...	
Project type	c	research, monitoring, etc.	research	
Project duration	n	in years	3	

field name	type	description	example	connection in parent table
Project leader	c	leader, contact person	F. Samu	
Institution	c	which provides institutional background, infrastructure	Plant Protection Institute	
Commissioned by	c	Commissioning institution	OTKA	
Project status	c	planned, ongoing, completed	ongoing	
Project level	c	main project, subproject	subproject	
<u>Preceding project</u>	c	id of related preceding project		Project.projectID
<u>Main project</u>	c	projectID under which the present project is a subproject	VegetStruct	Project.projectID
<u>Related project</u> Link	c	other projects related	HabitatPref	Project.projectID
Notes	t			

EXPERIMENT table

<u>ExperimentID</u>	c	identifier of experiment	jm1-95
Start date	d	start date of experiment	1995-05-12
End date	d	end date of experiment	1995-11-04
Aims	t		To find out the effect of unmown strips ..
Material and method	t		pitfall trapping
Design	t	description of experimental design, blocks, treatments	6 blocks: 3 normal mowing, 3 strip mowing...
Experimental sites	t	description of sites	Julianna-major, Nagykovácsi
Notes			

SITE table

<u>SiteID</u>	c	site identifier	jm1
Site name	c	user given name	JuliaExpField
Site description	t		Experimental fields of the Plant Protection Inst.
<u>Geographical name*</u>	c	geographical name of the site	Julianna-major

field name	type	description	example	connection in parent table
<u>Settlement name*</u>	c	administrative settlement name	Nagykovácsi	
Coordinate system	c		GPS	
Coordinate 1...n	n	geographical co-ordinates (in the convention of the co-ordinate system, e.g. degree, minute, second for longitude, latitudes	Coord1=N Coord2=47 Coord3=32 Coord4=52.3 Coord5=E Coord6=18 Coord7=56 Coord8=2.5	
Positioning mode	c		GPS	
GPS precision	n	precision of GPS positioning (m)	31	
Site diameter	n	mean diameter of site (m)	800	
Bounding rectangle co-ordinates 1...n	n	co-ordinates of the four corners of the rectangle bounding the site		
Site localisation precision	c	short description		
Reference	c	Map or other source used		
Elevation	n	above sea level (m)	320	
Exposition	c	compass directions or flat	flat	
Slope	n	inclination of slope	0	
Geomorphology	c	description of local geomorphology	agricultural, clay soil area	
Notes	t			

BLOCK table

BlockID	n	block identifier	76	
Block name	c	block name	StripAlfalfaStrip	
ExperimentID	c		jm1-95	Experiment.ExperimentID
<u>SiteID</u>	c		jm1	Site.SiteID
Block location 1...n	n	co-ordinates of block		
<u>HabitatID*</u>	n	identifier of habitat type	61	
Habitat description	t		2 yrs old alfalfa field	
<u>SoilID*</u>	n	identifier of soil type	27	

field name	type	description	example	connection in parent table
<u>Plant communityID*</u>	c	identifier of plant community		
<u>Crop**</u>	c		Alfalfa	
Field name	c	name or identifier of land parcel	"upper" field	
Treatment 1...n	c	values of different treatments, e.g. Treatment 1=sprayed or control, Treatment2= non-mown, mown1x, mown2x	Treatment1=strip mown Treatment2=mown area between strips	
Variables 1...n	n, c	user defined		
Notes	t			

SAMPLE table

<u>SampleID</u>	n	sample identifier	1417	
Sample date	d		6/7/95	
Sample time	d	if relevant		
<u>Sampling programID</u>	c		pt1	Sampling program.Sampling programID
<u>BlockID</u>	n		76	Block.BlockID
Sample size	n	if expected to change between samples, otherwise=1	3	
Sampling duration	n	if expected to change between samples, otherwise=1	7	
Sampling effort	n	if expected to change between samples, otherwise=1	1	
<u>PlantID*</u>	c	host plant from which collection was made		Plant.PlantID
Host animalID	c	host animal from which collection was made		Species.SpeciesID
<u>micro-habitatID*</u>	c		SoilSurf	Micro-habitat.Micro-habitatID
<u>CollectorID**</u>	c		NJ	Personnel.PersonID

field name	type	description	example	connection in parent table
Weather 1...n	n,c	user defined weather variables, description	weather1=26 weather2=0 weather3=overcast	
Phenology 1...n	n,c	user defined vegetation phenology description, e.g. height of crop, flowering state	Phenology1=40 Phenology2=10% in flower	
Variables 1...n	n, c	user defined e.g. var1=days after last mowing	var1=23	
Notes	t			

SAMPLING PROGRAM table

<u>Sampling programID</u>	c	Sampling program identifier	pt1	
<u>MethodID</u>	c	Method identifier	pitfall	Method.MethodID
Sampling program description	t		pitfall trapping with cup No. 1 type	
Sample size	n	if not expected to change between samples, otherwise=1	1	
Sampling duration	n	if not expected to change between samples, otherwise=1	1	
Sampling effort	n	if not expected to change between samples, otherwise=1	1	
Sample size unit	n	unit of measurement	No. of traps	
Sampling duration unit	n	unit of measurement	days after last emptying	
Sampling effort unit	n	unit of measurement	not defined	
Notes	t			

METHOD table

<u>MethodID</u>	c	method identifier	pitfall
<u>Method category**</u>	c		pitfall
Method description	t		pitfall trapping with preservation liquid
Equipment	c	equipment name	pitfall trap

field name	type	description	example	connection in parent table
Equipment description	t		2 dl plastic cup with insert	
Equipment property 1...n	c	Relevant properties (e.g. material, dimensions) that are characterised, measured	Equipment property 1=perimeter	
Equipment property attribute 1...n	c	e.g. type of material used in, or to make the equipment		
Equipment property measure 1...n	n	measurements of property of the equipment	Equipment property measure 1=25.12	
Equipment property unit 1...n	c		Equipment property unit 1=cm	
Notes	t			

SPECIES table

SpeciesID	c	species/taxon identifier	paragr	
GuestID 1...n	c	identifier from another database(s)		
Species code	c	species mnemonic	pardagre	
<u>GenusID</u>	c	genus identifier	par	Genus.GenusID
Species name	c	valid specific name	agrestis	
Common name	c			
Author	c	descriptor of species	Westring	
Description year	n		1861	
Brackets	l	True if author in brackets	TRUE	
Taxon type	c	e.g. OTU, ssp=sub-species, sp=species, gen=genus; needed, because level of determination can be different from species	sp	
Species interpretation	c	e.g. <i>sensu stricto</i> , <i>sensu lato</i>		
Status	c	e.g. under description		
Species validity	l	True if taxon is valid	TRUE	

field name	type	description	example	connection in parent table
Source	t	reference for obtaining species as a valid name		
Notes	t			

SYNONYM table

<u>SynonymID</u>	c	synonym species identifier	lycosagre	
<u>SpeciesID</u>	c	identifier of senior synonym	paragr	Species.SpeciesID
Species name	c		Lycosa	
Genus name	c		agrestis	
Author	c		Westring	
Description year	n		1861	
Brackets	l	True if author in brackets	FALSE	
Source	t	reference for synonymisation	Roewer, 1954	
Notes				

SPECIES PROPERTY table

<u>SpeciesID</u>	c	identifier of species	paragr	Species.SpeciesID
Size 1...n	n	size in mm	8	
Phenology 1...n	c	description of phenology, can be defined separately for stages	adults: Apr-Sept	
GuildID**	c	guild identifier	DayHunt	
Variables 1...n	n, c	user defined, other relevant properties		
Notes	t			

GENUS table

<u>GenusID</u>	c	identifier of genus	par	
Genus name	c		Pardosa	
<u>FamilyID</u>	c		ly	Family.FamilyID
Notes	t			

field name	type	description	example	connection in parent table
FAMILY table				
FamilyID	c	identifier of family	ly	
Family name	c		Lycosidae	
OrderID	c		a	Order.OrderID
Notes	t			
CATCH table				
LotID	n	identifier of lot	14796	
<u>ProcessingID</u>	n		112	Processing log.ProcessingID
<u>SampleID</u>	n		1417	Sample.SampleID
Subsample	n		2	
<u>SpeciesID</u>	c		paragr	Species.SpeciesID
<u>Sex**</u>	c	sex of individuals in the lot	mal	
<u>Stage**</u>	c	developmental stage (instar)	adu	
Grouping variable 1...n	c	other variables that delimit the lot		
Catch	n	amount in the lot (according to data type)	1	
Data type	c	data type of Catch (e.g. count, estimate, binary)	c	
Missing	l	True if missing data (if application cannot handle this type of value)	FALSE	
PROCESSING LOG table				
ProcessingID	n	identifier of processing	112	
Processed by	c	Person who determined, processed the material	NJ	Personnel.PersonID
Processing date	d		4/29/96	
<u>Revised by 1.2</u>	c		Personnel.PersonID	
Revision date 1.2	d			

field name	type	description	example	connection in parent table
<u>Determination status</u> **	c	e.g. revision needed		
Determined	l	True if determined	TRUE	
Data entry by	c	Person who made computer data input	NJ	Personnel.PersonID
Data entry date	d		10/12/96	
PERSONNEL table				
PersonID	c	identifier of person	NJ	
Name	c		Németh, József	
Institute	c		Plant protection Inst.	
Address	c		15 Herman O. Str., Budapest ...	
E-mail	c		gaius@fs2.bdtf.hu	
Notes	c			
LOT VARIABLES table				
LotID	n	identifier of lot	14796	
<u>MeasurementID</u>	n		573	Measurement.MeasurementID
Variable 1...n	c, n	user defined variables (e.g. morphometric measurements)	Var1=2.7 Var2=3.8	
MEASUREMENT table				
MeasurementID	n	identifier of measurement	573	
Measurement description	t		Size measurement (prosoma and opisthosoma length, mm)	
Measurement date	d		4/29/96	
Variable definition 1...n	c		VariableDef1=ProsLen	
VariableDef2=OpistLen				
Notes	c		measured with IMA-GOES: pag124.dbf	

DESCRIPTION OF GORGODERINA GRACILIS SP. N. (TREMATODA, GORGODERIDAE) FROM ICHTHYOPHIS SUPACHAI TAYLOR, 1960 (AMPHIBIA, ICHTHYOPHIIDAE) OF THAILAND

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A new gorgoderinid species *Gorgoderina gracilis* sp. n. is described from the *Ichthyophis supachaii* (Amphibia, Ichthyophiidae) of Thailand. It belongs to the species group having unlobed vitelline follicles near the ventral sucker and differs from all the other species of the genus by the following character combinations: smaller sucker ratio, arrangement, shape and position of the testes and vitellaria. The new species represents a new host and locality records. A key to the Indomalayan species is given.

Key words: *Gorgoderina*, Gorgoderidae, Trematoda, *Ichthyophis*, Thailand

INTRODUCTION

During the course of a survey of helminth parasites of fishes, amphibians and reptiles of the Doi Suthep-Pui National Park (Chiang Mai, Thailand) carried out between January and June 1997, a collection of trematodes was obtained that included a gorgoderinid species.

This contribution is a presentation of this species which is the first record of this genus from Thai amphibians.

MATERIALS AND METHODS

Among the 7 specimens of *Ichthyophis supachaii* obtained from the Doi Suthep-Pui National Park (Chiang Mai) 4 specimens were infected with this trematode. Worms were washed in saline, fixed in formalin (10%) under light coverglass pressure and stored in 70% ethanol. Later, they were stained in borax carmine, destained in diluted HCL, dehydrated in ascending concentration of ethanol, cleared in xylene and mounted in permount.

Drawing was prepared by microprojection and details filled in through microscopic observation.

Specimens deposited: Parasitology Research Laboratory, Department of Biology, Chiang Mai University; Holotype No.: CMU-T-0001, paratypes No.: CMU-T-0002-4.

***Gorgoderina gracilis* sp. n.**

(Fig. 1)

Family Gorgoderidae (LOOSS, 1899) LOOSS, 1901

Subfamily Gorgoderinae LOOSS, 1899

Host: *Ichthyophis supachaii* TAYLOR, 1960 (Amphibia, Ichthyophiidae).

Site: urinary bladder.

Type locality: Thailand, Chiang Mai, Doi Suthep-Pui National Park

Description. Based on 4 whole mounts. Body elongate, spindle-shaped with bluntly rounded anterior and pointed posterior ends; 2250-2400 μm ; width at level of first testis 250-550 μm ; width 11-30% of length. Tegument smooth, aspinose. Oral sucker terminal, almost spherical, 225-250 \times 275 μm . Ventral sucker in anterior third of body, spherical, either equal in size with oral sucker or smaller, 175-225 μm . Sucker ratio 1 : 0.75-1.0. Pharynx absent, oesophagus short, 50-70 μm ; intestinal bifurcation 230-250 μm before ventral sucker; caeca along lateral sides reach close to posterior extremity. Gonads in middle third of body; two testes elongate, somewhat quadrangular in shape, diagonally placed, intercaecal with waving edges but without lobes. Anterior testis on right side just behind vitelline gland, 230-375 \times 90-200 μm , posterior testis behind ovary on left side, 400-425 \times 105-200 μm . Vas deferens runs anteriorly forming seminal vesicle 100 \times 70-90 μm , in front of ventral sucker; genital opening median or submedian, behind caecal bifurcation. Ovary ovoid between left vitelline gland and left testis, 115-200 \times 115-75 μm . Two ovoid compact vitellaria lying just below acetabulum, right vitelline gland, 90-100 \times 60 μm , left vitelline gland 60-90 \times 60-75 μm . Uterus in body part behind ventral sucker, consisting of ascending and descending coils, occupying available place between genital pore and posterior extremity. Eggs small 20-23 \times 11-13 μm , thin-shelled, embryonated.

Prevalence: 42.8%. *Mean intensity:* 1.3. *Abundance:* 0.5.

Etymology. This species was named after its slender body shape.

DISCUSSION

The specific identities of the newly described species, *Gorgoderina gracilis* can be analysed on the basis of morphological characters, scope of the definitive hosts and from zoogeographical point of view.

The genus *Gorgoderina* LOOSS, 1899 includes numerous species (approximately 40) which are parasitic in the urinary bladder mainly in anuran amphibians. The genus was divided into two subgenera (*Gorgoderina*, *Neogorgoderina*) by PEREIRA and CUOCOLA (1940) on the basis of the lobation of the vitellaria. PIGULEVSKY (1953) recognized also two subgenera (*Gorgoderina*, *Gorgorimma*) based upon the position of the vitellaria to the acetabulum. FER-

NANDES (1958) differentiated three subgenera: *Gorgoderina* (vitellaria lobed, not divided free acini), *Gorgorimma* (vitellaria compact, unlobed) and *Metagorgoderina* (vitellaria deeply lobed with free acini). DOLLFUS (1958) and YAMAGUTI (1971) questioned these subgeneric splittings and the latter writer suppressed these subgenera. Nevertheless, among the gorgoderinid species these group characters (? subgeneric) can be recognized but their taxonomic value may be the matter of discussion depending on the diverse opinions on the stability of these characters. (Present authors do not intend to take a stand on the subgeneric problems due to the limited number of such material available.) *Gorgoderina gracilis* sp. n. belongs to the species-group having unlobed vitellaria which are situated near the ventral sucker. Its main specific characters are the presence of a ventral sucker being the same size or smaller than that of the oral one, rather quadrangular testes and longitudinal oval vitelline follicles. Taking these morphological characters into account *Gorgoderina gracilis* sp. n. shows the closest similarity to *G. parvicava* TRAVASSOS, 1922 (on the basis of the sucker ratio) and *G. carli* BAER, 1930 (on the basis of the position of the gonads and the definitive hosts). The former species was described from bufonid, cystignatid and rapid amphibians of Brazil (TRAVASSOS 1922); the latter species was found in caecilian amphibians in India (BAER 1930) and in Sri Lanka (CRUSZ & SANTIAPILLAI 1982). *Gorgoderina gracilis* sp. n. differs from *G. parvicava* in having diverse shape and position of gonads (mainly testes), diverse definitive hosts and geographical distribution. *Gorgoderina gracilis* sp. n. differs from *G. carli* in having diverse sucker ratio, size and shape of testes and in longer oesophagus.

Gorgoderina gracilis sp. n. zoogeographically belongs to the Indomalayan realm. In this region, besides the presently described new species, six additional gorgoderinids have been reported, namely *G. carli* BAER, 1930 from India and from Sri Lanka (CRUSZ & SANTIAPILLAI 1982); *G. malaysiensis* FISCHTHAL et KUNTZ, 1965 from Malaysia (North Borneo); *G. infundibulata* DWIVEDI, 1968; *G. ellipticum* DWIVEDI, 1968; *G. symmetriorchis* DWIVEDI, 1968 and *G. chauha-*

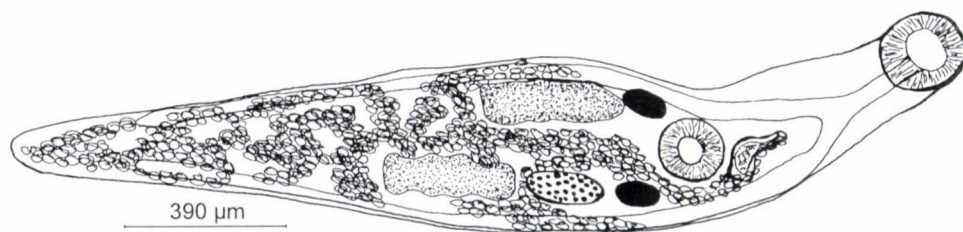


Fig. 1. *Gorgoderina gracilis* sp. n., ventral view

ni PRASAD et PRASAD, 1990 from India. For differentiation of these species the following key is recommended.

KEY TO THE SPECIES OF THE INDOMALAYAN GORGODERINIDS*

- | | | |
|----|---|---|
| 1. | Ventral sucker bigger than oral sucker | 2 |
| – | Ventral sucker either smaller or equal in size with oral sucker | |
| | | G. gracilis sp. n. |
| 2. | Testes tandem | 3 |
| – | Testes symmetrical | <i>G. symmetriorchis</i> DWIVEDI |
| 3. | Ventral sucker in line of ventral surface | 4 |
| – | Ventral sucker drawn out from body surface | <i>G. infundibulata</i> DWIVEDI |
| 4. | Ovary entire | 5 |
| – | Ovary lobate | <i>G. ellipticum</i> DWIVEDI |
| 5. | Ovary on the left side, right testis preceding left testis | 6 |
| – | Ovary on right side, left testis preceding right testis | |
| | | <i>G. malaysiensis</i> FISCHTHAL et KUNTZ |
| 6. | Oesophagus present | <i>G. carli</i> BAER |
| – | Oesophagus absent | <i>G. chauhani</i> PRASAD et PRASAD |

*

Acknowledgements – The authors are indebted to the Department of Biology, Faculty of Science, Chiang Mai University. This work was supported by TRF/BIOTEC Special Programme for the Biodiversity Research and Training (grant BRT 139031).

* *G. (=Gorgoderina) loossi* ? is not included, although it was listed among the Indian gorgoderinid species by PRASAD and PRASAD (1990) since the authors do not know such a species name in this genus.

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Catalogue of Palaearctic Diptera

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REVISION OF CENTRAL AND WEST EUROPEAN TOMOSVARYELLA ACZÉL SPECIES (DIPTERA, PIPUNCULIDAE)

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The present study revises the representatives of the genus *Tomosvaryella* ACZÉL in West and Central Europe. Fourteen species are discussed, including two new ones: *T. magyarica* FÖLDVÁRI et DE MEYER and *T. hortobagiensis* FÖLDVÁRI et DE MEYER. *T. rondanii* (COLLIN, 1945) is considered as a junior synonym of *T. minima* (BECKER, 1898). Lectotypes are designated for *T. kuthyi* ACZÉL, 1944 and *T. cilitarsis* (STROBL, 1910). All species are re-described with illustrations of male and female terminalia, and appended with a detailed discussion on type identity, intraspecific variation and species recognition where appropriate. An identification key for both sexes is given.

Key words: taxonomy, Pipunculidae, *Tomosvaryella*, new species, Central and West Europe

INTRODUCTION

Pipunculidae are small inconspicuous flies, closely related to the hoverflies. They can be readily differentiated from the latter by the wing venation and by the hemispherical head being largely occupied by the compound eyes (DE MEYER 1989). During the larval stage they are endoparasites of Auchenorrhyncha (Homoptera). The genus *Tomosvaryella* can be differentiated from other pipunculid genera by the combination of following characters: pterostigma not coloured, and cross-vein R-M near middle of discal cell (in some Afrotropical species the cross-vein can be situated closer to the base of the discal cell as in *Dorylomorpha*, see DE MEYER 1993). The genus has a cosmopolitan distribution with about 250 hitherto described species. The fauna of some biogeographical regions was recently revised, such as the Neotropical (ALE-ROCHA 1996) and Afrotropical (DE MEYER 1993) fauna, and several new species were described from the Central Palaearctic Region (KUZNETZOV 1994). The European fauna is slightly limited with approximately 25 species. Nevertheless, many identification problems remain. ACZÉL's monograph (1944) is now incomplete and outdated. Recent keys and records are sometimes incomplete or unreliable because of errors in species recognition. These shortcomings are mainly due to the large uniformity

in external morphology, confusing species concepts based on presumed absence of existing type material and erroneous recognition, and intraspecific variation. The present study mainly focuses on the fauna of West and Central Europe, comprising 14 species including two newly described. References are, however, made to related species in other biogeographical regions of Europe.

MATERIAL AND METHODS

Some of BECKER's types, normally in the MNHU collection, were studied by one of the authors (MDM) in St. Petersburg where they are momentarily on loan (this is indicated in the text where appropriate). Terminology follows ALBRECHT (1990) except the term "phallic guide" is used instead of "aedeagus" as agreed on the IVth International Congress of Dipterology (Oxford, 1998) where a number of Pipunculidae specialists discussed common use of certain morphological terms. Likewise, the term "pollinose" or "pollinosity" is used for all surfaces covered with microtrichia. Genitalia were dissected and mounted as outlined in DE MEYER (1989). Drawings were made with a drawing tube attached to a microscope (except for female of *T. cilifemorata*; cf. below).

Tomosvaryella ACZÉL, 1939

Tomosvaryella ACZÉL, 1939: 22. Type species: *Pipunculus sylvaticus* MEIGEN, 1824, by original designation.

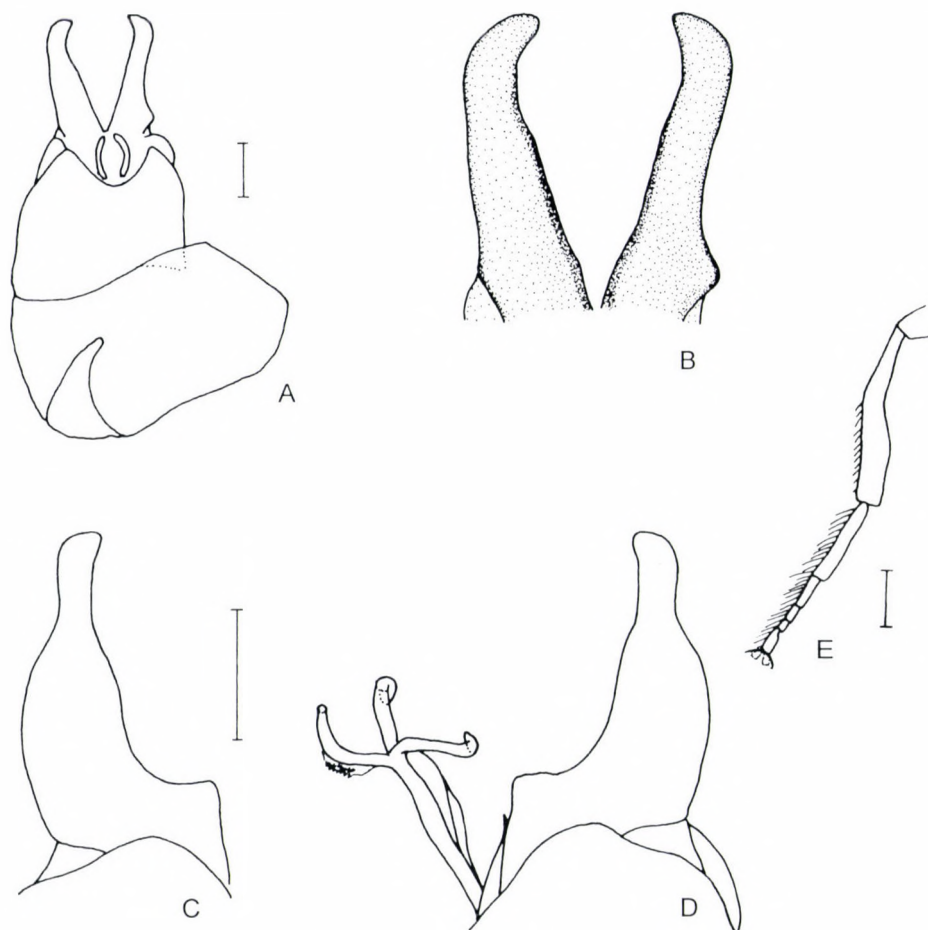
Alloneura RONDANI, 1856: 140. Type species: *Pipunculus flavipes* MEIGEN, 1824, by monotypy. Suppressed by ICZN 1961: 230 (Opinion 597).

KEY TO THE WEST AND CENTRAL EUROPEAN SPECIES OF TOMOSVARYELLA

Males

- 1 Halter dark brown or black. Longer hairs ventrally on hind femur, on distal half as long as width of femur. Genitalia as in Fig. 11
T. cilifemorata (BECKER)
- Halter pale yellowish or white. Hairs on hind femur always shorter than width of femur 2

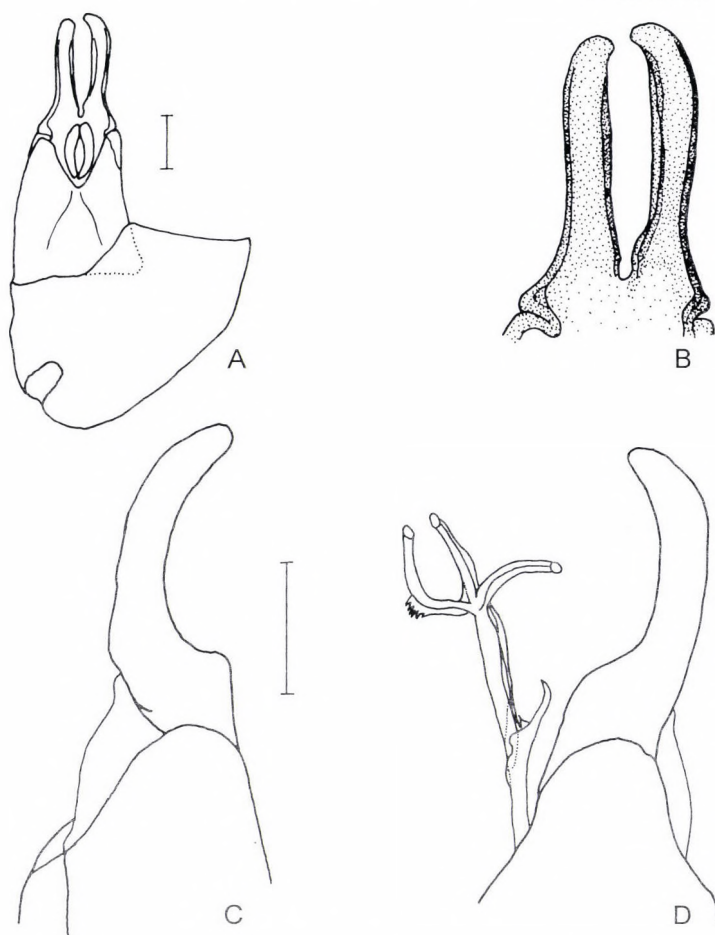
- 2 Humerus dark, brown. Genitalia as in Fig. 4 *T. palliditarsis* (COLLIN)
- Humerus pale, yellow or yellowish white 3
- 3 Hind tarsal segments with long, erected hairs. Hind tibia abruptly bent and slightly thicker in apical half (Fig. 1E) *T. cilitarsis* (STROBL)
- Hind tarsal segments without longer hairs. Hind tibia slightly curved but not bent 4



Figs 1A–E. *Tomosvaryella cilitarsis*, ♂ terminalia. Styriae, paralectotype. A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus, phallic guide and ejaculatory duct, lateral; E: ♂ hind tibia and tarsal segments, posterior view. Scale: 0.1 mm

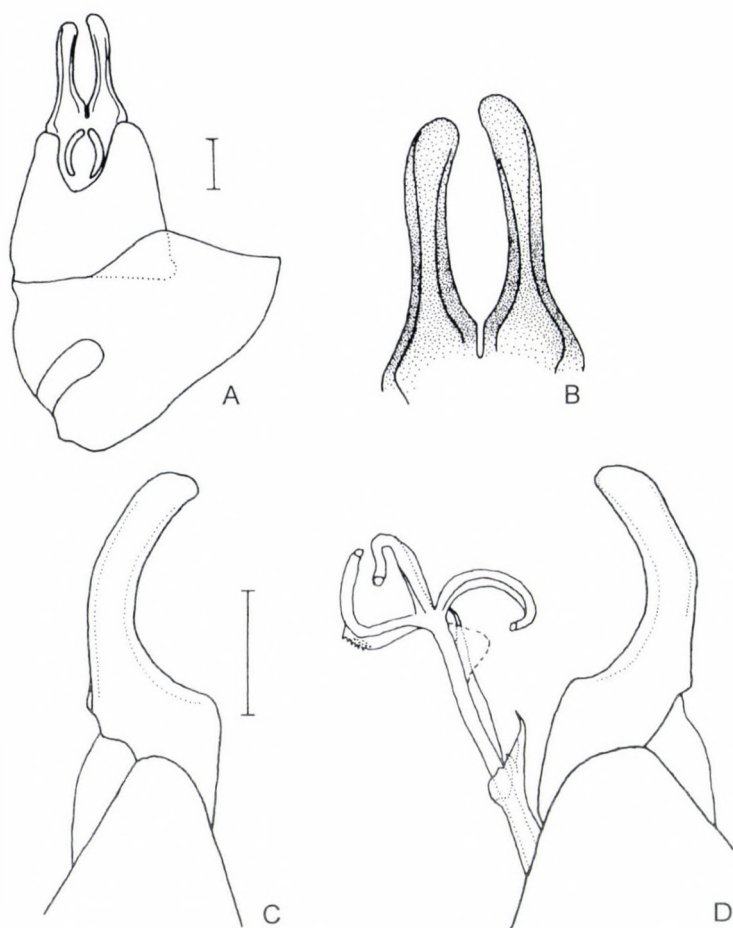
- 4 Epandrium enlarged, divided into two parts by epandrial groove (Fig. 12A) *T. coquilletti* (KERTÉSZ)
- Epandrium without division 5
- 5 Eyes touching for distance less or equal to the length of ocellar triangle 6
- Eyes touching for distance at least 1.5 times the ocellar triangle 8
- 6 Surstyli long and slender, not broadening towards tip in dorsal view. Phallic guide shorter than half length of ejaculatory ducts (Fig. 2)

T. littoralis (BECKER)



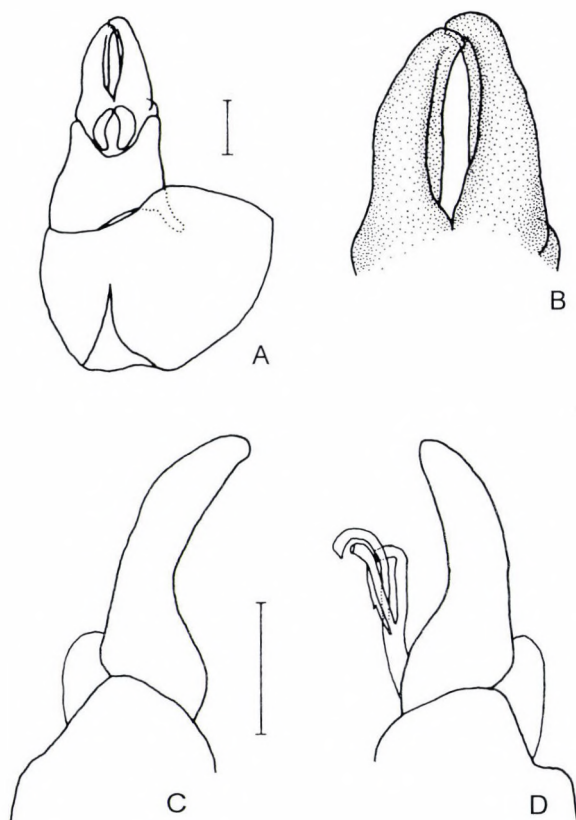
Figs 2A–D. *Tomosvaryella littoralis*, ♂ terminalia. Knokke (23.V.1937). A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

- Surstyli shorter, broader at base and at one third from tip in dorsal view. Phallic guide longer than half length of ejaculatory ducts, slender (Figs 5, 6)
7
- 7 Distinct edge along each surstylus in dorsal view. Surstyli broadest at one third from tip in lateral view. Phallic guide strongly curved and pointing towards surstyli in lateral view (Fig. 6) ***T. hortobagyiensis* sp. n.**
- Surstyli without edge in dorsal view, broader at basal third in lateral view. Phallic guide slightly curved, not pointing towards surstyli in lateral view (Fig. 5) *T. minima* (BECKER)



Figs 3A–D. *Tomosvaryella sylvatica*, ♂ terminalia. Oszla. A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

- 8 Sternites with velvet like pilosity. Surstyli short, broader at tip or sometimes as broad as base in dorsal view (Fig. 14) *T. geniculata* (MEIGEN)
- Sternites without velvet like pilosity. Surstyli longer and narrower at tip than at base in dorsal view 9
- 9 Membranous area very narrow, slit like viewed from behind. Hind trochanter with at least four short spines. Tergite 5 with conspicuous, longer dark hairs. Genitalia as in Fig. 3 *T. sylvatica* (MEIGEN)
- Membranous area at least as broad as one third of width of tergite 5 viewed from behind. Hind trochanter without spines. Tergite 5 at most with short, weak hairs 10



Figs 4A–D. *Tomosvaryella palliditarsis*, ♂ terminalia. Crowborough, syntype. A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus and ejaculatory duct, lateral. Scale: 0.1 mm

- 10 Membranous area is in dorsal view very deep, wedge like and reaches almost the epandrium, which is broader than long. Surstyli broad at base and narrow, rounded at tip in dorsal view (Fig. 15). Fore and mid femora posteriorly and hind trochanter anteriorly with conspicuous greyish pollinosity

T. mutata (BECKER)

- Membranous area not deep and not wedge like in dorsal view, epandrium longer than broad. Surstyli broad at base but not narrow and rounded at tip in dorsal view. Anterior four femora at most with weak greyish pollinosity

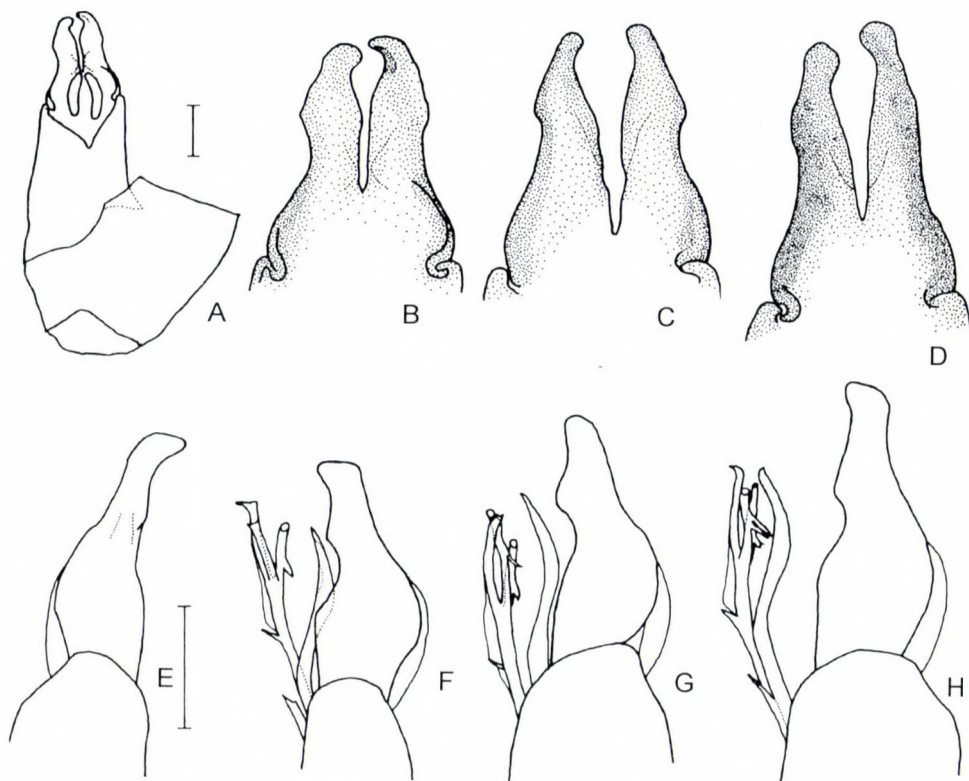
11

- 11 Apical part of phallic guide is split into two parts (Figs 13E-F). Hind femur without hairs

T. magyarica sp. n.

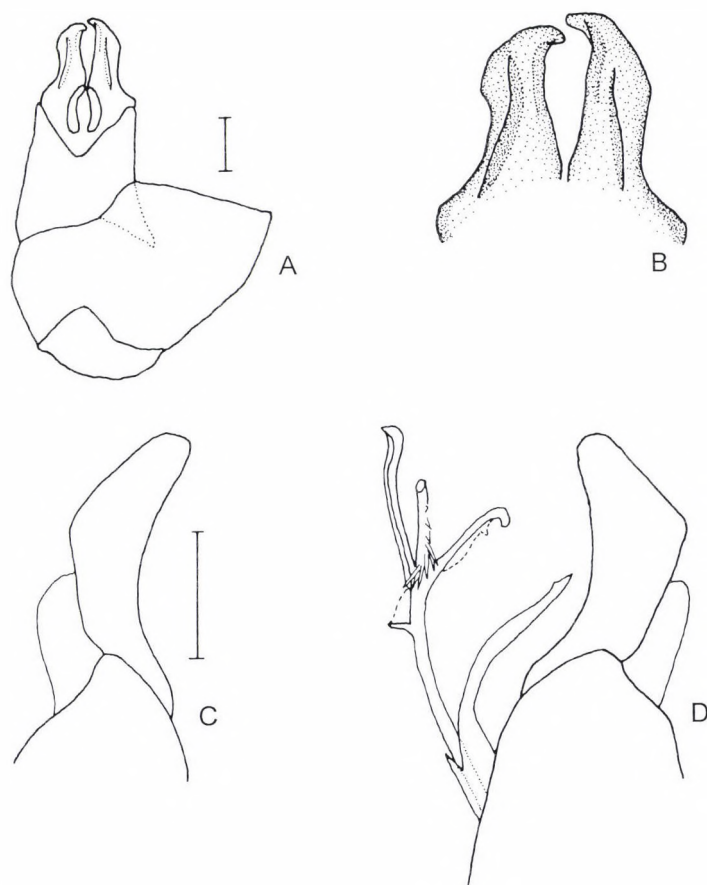
- Apical part of phallic guide not split. Hind femur with a row of longer hairs

12



Figs 5A–H. *Tomosvaryella minima*, ♂ terminalia. Gyón (23.VII.1904): A–B, E–F; Nunspeet (13.VI.1977): C, G; Fülöpháza (10.V.1978): D, H. A: dorsal view; B–D: surstyli, dorsal; E: inner surstylus, lateral; F–H: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

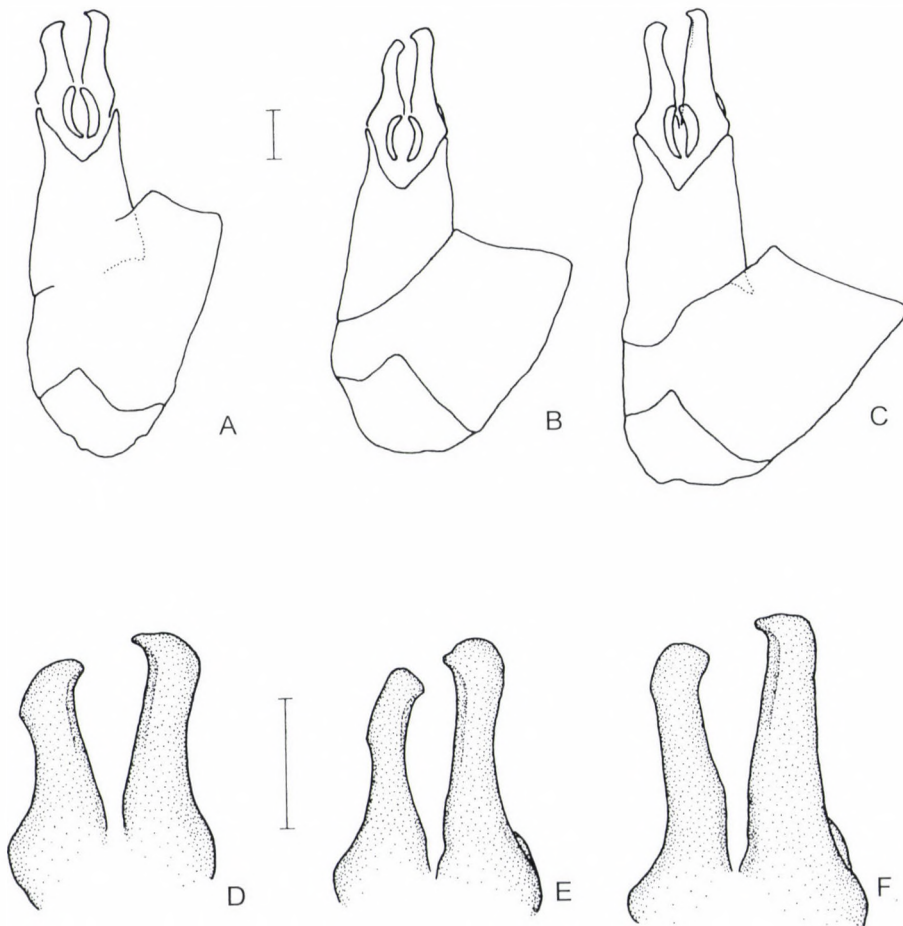
- 12 Ejaculatory duct with a row of long teeth, tip of surstyli strongly curved toward each other in dorsal view (Fig. 9) *T. israelensis* DE MEYER
- Ejaculatory duct without a row of long teeth, surstyli slightly curved toward the other in dorsal view, pointed (Figs 7, 10) 13
- 13 Generally larger flies (wing length 3 mm or more), inner surstylus with angled base in lateral view (Figs 8D-F) *T. kuthyi* ACZÉL
- Generally smaller flies (wing length less than 3 mm), inner surstylus without angled base in lateral view (Fig. 10C) *T. freidbergi* DE MEYER



Figs 6A–D. *Tomosvaryella hortobagiensis* sp. n., ♂ terminalia. Kunmadaras. A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

Females

- 1 Halter dark brown or black; ovipositor as in Fig. 16L
?T. cilifemorata (BECKER)
- Halter yellow, at most stem darkish; ovipositor of different shape 2
- 2 Humerus dark brown or black; ovipositor as in Fig. 16D
T. palliditarsis COLLIN
- Humerus pale, yellow or yellowish white; ovipositor of different shape 3



Figs 7A–F. *Tomosvaryella kuthyi*, ♂ terminalia. Budapest: A, D; Pálmátér, lectotype: B, E; Pelsőcz: C, F. A–C: dorsal view; D–F: surstyli, dorsal. Scale: 0.1 mm

3 Base of ovipositor with distinct knob-like protuberance (Figs 16E, M) 4

— Base of ovipositor without distinct protuberances, at most with median thickening 5

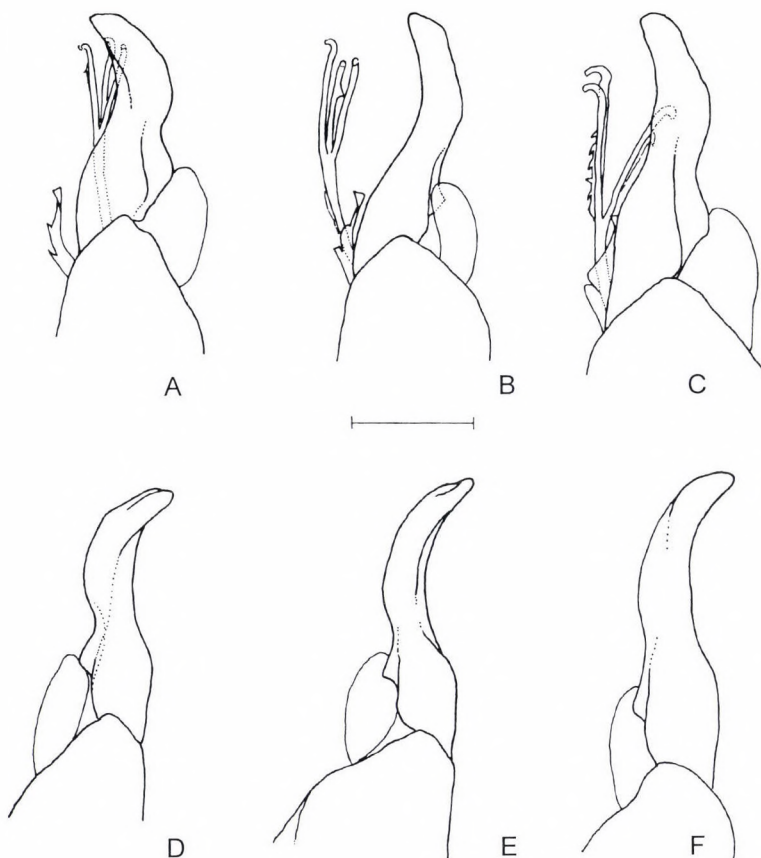
4 Piercer of ovipositor straight and very thin (Fig. 16M)

T. magyarica sp. n.

— Piercer of ovipositor downcurved and thicker (Fig. 16E)

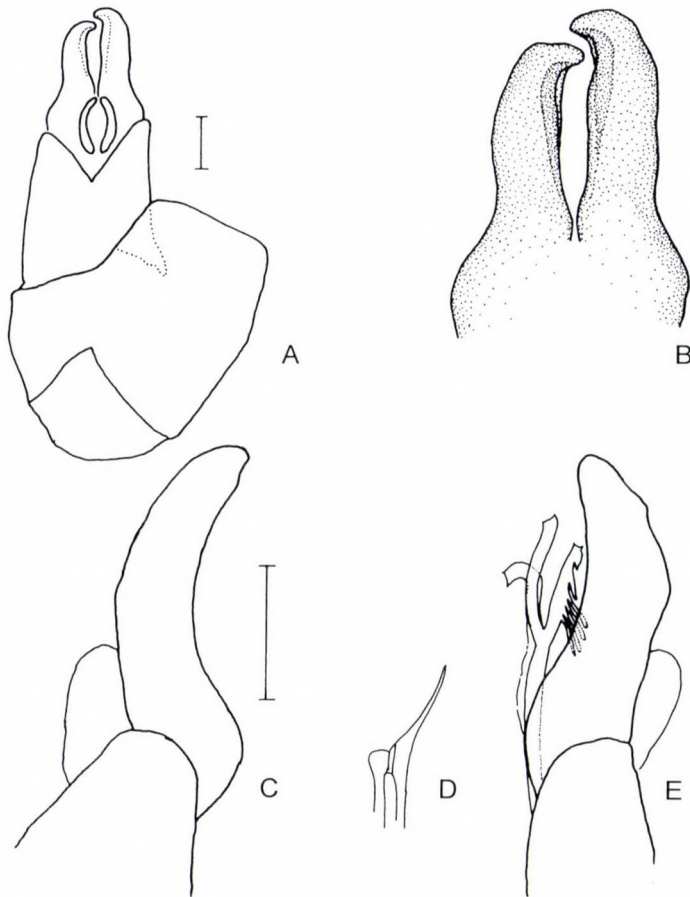
?T. hortobagiensis sp. n.

(possibly female, cf. remarks under species description)



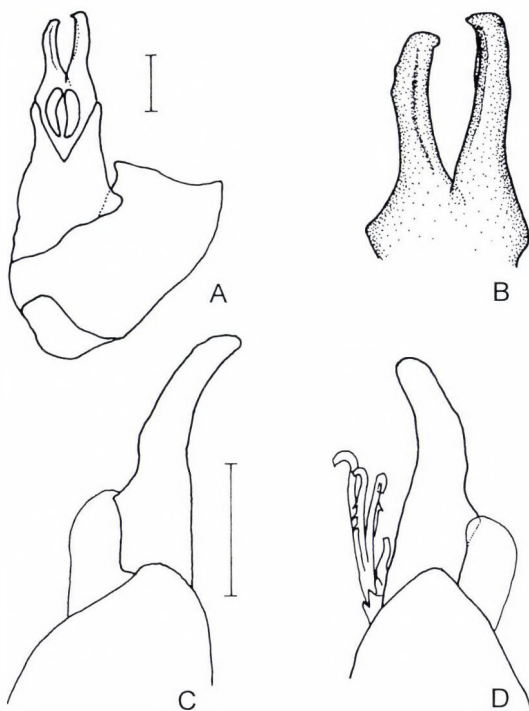
Figs 8A–F. *Tomosvaryella kuthyi*, ♂ terminalia. Budapest: A, D; Pálmátér, lectotype: B, E; Pelsőcz: C, F. A–C: outer surstylus, phallic guide and ejaculatory duct, lateral view; D–F: inner surstylus, lateral. Scale: 0.1 mm

- 5 Abdominal tergites with pale hairs; ovipositor as in Fig. 16B
T. littoralis (BECKER)
- Abdominal tergites with dark hairs; ovipositor of different shape 6
- 6 Frons with at most lower third distinctly pollinose; pulvilli and claws short; front femur without basal spines; ovipositor as in Fig. 16N
T. geniculata (MEIGEN)
- Frons with at least lower half pollinose, usually more so and at most shining black just in front of ocellar triangle; pulvilli and claws long; front femur with basal spines; ovipositor of different shape 7



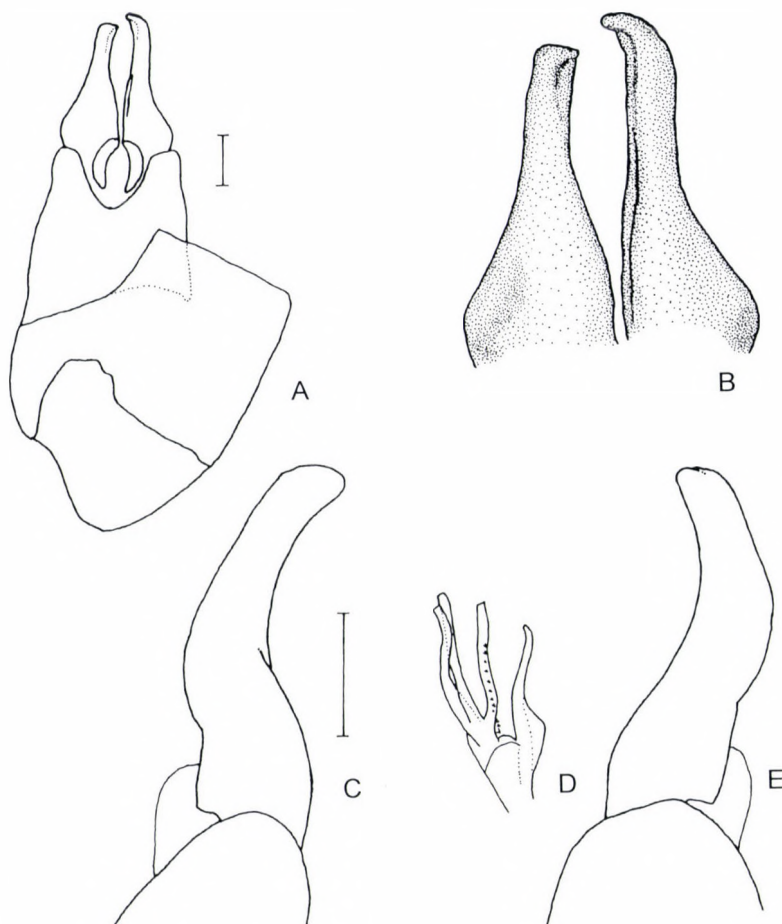
Figs 9A–E. *Tomosvaryella israelensis*, ♂ terminalia. N. Amud, paratype: A–C, E; Meron, paratype: D. A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: phallic guide, ventrolateral; E: outer surstylus and ejaculatory duct, lateral. Scale: 0.1 mm

- 7 Base of ovipositor short and roundish, piercer distinctly curved upwards, scimitar-shaped (Fig. 16O) *T. mutata* (BECKER)
- Base of ovipositor longer, piercer either straight or downcurved 8
- 8 Piercer very long, reaching tergite 1, and distinctly downcurved (Figs 16H-I). Pulvilli wide and long *T. kuthyi* ACZÉL
- Piercer shorter, at most reaching tergite 2, either straight or downcurved. Pulvilli narrower 9
- 9 Piercer distinctly downcurved (Figs 16J-K) 10
- Piercer straight or at most slightly downcurved (Figs 16A, C, F-G) 11



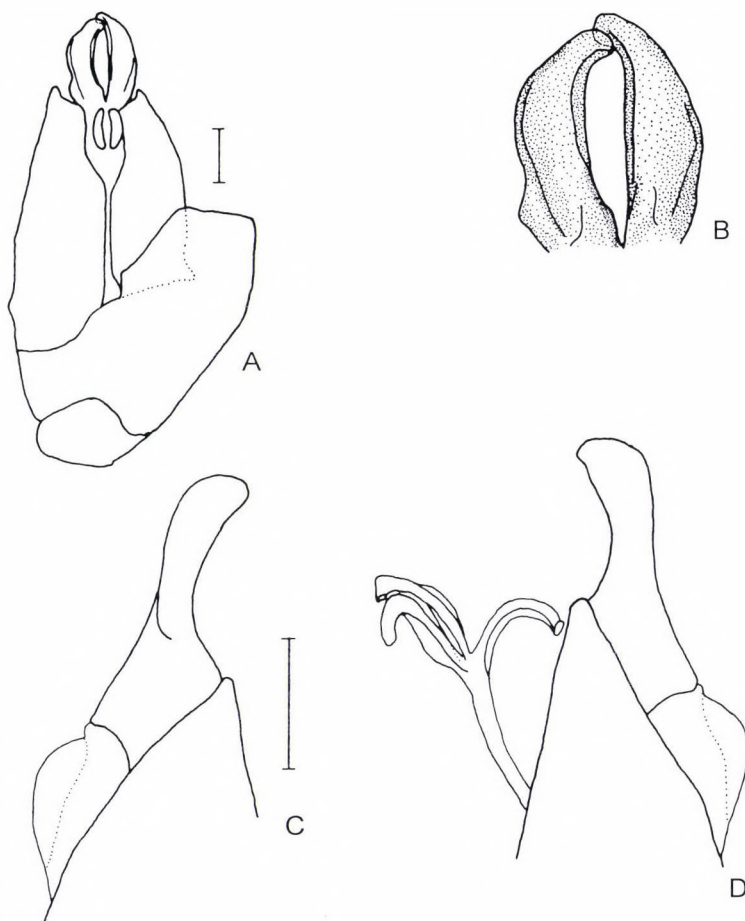
Figs 10A–D. *Tomosvaryella freidbergi*, ♂ terminalia. Mt. Hemron (1.VII.1986), paratype. A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

- 10 Large species (more than 3 mm). Piercer as in Fig. 16J; base more flattened
T. israelensis DE MEYER
- Smaller species (less than 3 mm). Piercer as in Fig. 16K; base more roundish
T. freidbergi DE MEYER
- (both species very similar in general appearance and specimens of close size range will probably not be differentiated).



Figs 11A–E. *Tomosvaryella cilifemorata*, ♂ terminalia. Visperterminen (21.VII.1993). A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: phallic guide and ejaculatory duct, ventrolateral; E: outer surstylus, lateral. Scale: 0.1 mm

- 11 Piercer fairly long, weakly downcurved (Fig. 16C)
T. sylvatica (MEIGEN) / *T. coquilletti* (KERTÉSZ)
 (both species cannot be separated)
- Piercer short, at most 1.5 times length of base, straight (Figs 16A, F-G) 12
- 12 Hind leg distinctly curved (as in male). Ovipositor as in Fig. 16A
T. cilitarsis (STROBL)
- Hind leg straight or at most weakly curved. Ovipositor as in Figs 16F-G
T. minima (BECKER)



Figs 12A–D. *Tomosvaryella coquilletti*, ♂ terminalia. Csévharaszi. A: dorsal view; B: surstylus, dorsal; C: inner surstylus, lateral; D: outer surstylus and ejaculatory duct, lateral. Scale: 0.1 mm

T. cilitarsis (STROBL, 1910)
(Figs 1, 16A)

Pipunculus cilitarsis STROBL, 1910: 113.

Pipunculus pilitarsis COLLIN, 1920: 274 [unavailable name].

Pipunculus forsiusi FREY, 1932: 83. – syn.: ACZÉL, 1944: 86.

Type material: Syntypes: 2 ♂♂ 2 ♀♀, Styriae, Austria. 2 ♂♂ are mounted with separate minuten on the same support and supporting pin. Pin carries handwritten label: "P. cilipes / m ♂ var". 2 ♀♀ mounted identical way on separate pin and support. Pin carries handwritten label: "P. cilipes / m ♀ var". A third label is present, not attached to any of the two mounting pins, with handwritten "Pipunculus cilipes tarsis [latter written above strikethrough] m / var ♂ / [printed] Styriae al / STROBL." One male is dissected. The undissected male is hereby designated as lectotype, the other male and two females as paralectotypes.

Other material examined: Switzerland: 1 ♂, Il Fuorn, 18.VIII.1982, J. P. Haenni (KBIN). Spain: 1 ♂, Pina de Ebro, 24.V.1991, Blasco-Zumeta (KBIN).

Male – *Head*. (Missing in syntypes, based on specimen from Spain). Third antennal segment acuminate; yellow-brown. Face silver-grey pubescent. Frons, lower part greyish, upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 8 ommatidia). Occiput, upper half sparsely with brownish pollinosity, mainly subshining black, lower half more densely with silver-grey pollinosity.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) with brownish pollinosity, subshining black-brown, along anterior margin with different tinge, more golden brown. Scutellum and posterior margin of mesonotum more shining black, weakly brownish pollinose. Dorsocentral hairs short to medium long, well pronounced, dark, anteriorly somewhat longer.

Legs black, knees with basal fifth of tibiae yellow, hind tibia slightly more, basal fourth yellow. Tarsal segments yellow-brown, last tarsal segment darker brownish. Fore femur without basal spines. Hind trochanter with at most two short spines. Hind tibia abruptly bent and slightly thicker in lower half. Hind tarsal segments with long erected hairs (Fig. 1E). Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section twice as long as third costal section. Cross vein R-M at middle of discal cell. Halter yellow, base dark.

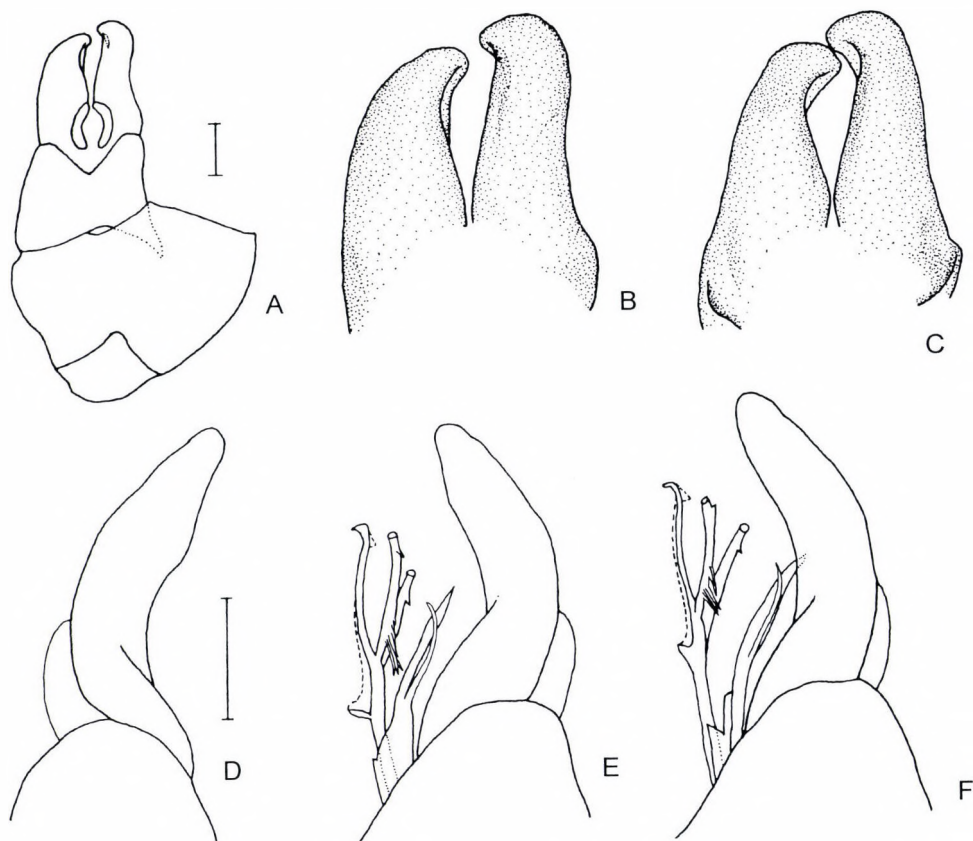
Abdomen. Viewed obliquely from front tergites black-brown shining, sparsely brownish pollinose. Hairs dispersed, short but well pronounced, black; tergite 5 with somewhat longer hairs. Male genitalia as in Figs 1A-D.

Female – As male except for the following characters. Third antennal segment acuminate; yellow-brown. Face silver-grey pubescent. Eyes separated; frons, greyish, in front of ocellar triangle shining black. Occiput, upper half sparsely with brownish pollinosity, mainly subshining black, lower half more densely with silver-grey pollinosity. Fore and mid femora with two ventral spines basally. Pulvilli at most as long as last tarsal segment. Hind tibia also deeply bent but no outstanding hairs on first tarsal segment, slightly outstanding hairs on tarsal segments 2–5 but not as striking as in male. Female ovipositor as in Fig. 16A.

Remarks. This species is related to *T. sylvatica* and *T. littoralis*, based on the shape of the male genitalia and the slit like membranous area on abdominal sternite 8. It is a rather uncommon species, in West Europe restricted to higher altitudes or colder places (e.g. Scotland in the UK, Hautes Fagnes in Belgium). The species was, however, found in Spain in large numbers in a xerophilic surrounding (DE MEYER 1997). The male genitalia in the latter series show some slight

variation with the West and Central European specimens but are considered conspecific, given the variety seen in male genital structure in other *Tomosvaryella* species.

T. cilitarsis can be differentiated from any other West or Central European *Tomosvaryella* species by the outstanding hairs on the hind tarsal segments. KUZNETZOV (1993) described a species with similar pilosity from St. Petersburg area: *T. rossica*. The two species differ in the shape of male genitalia. KUZNETZOV (1993) based his differences and illustrations on comparison with type material of *T. forsiusi*, a junior synonym of *T. cilitarsis*, and for which he designated a lectotype. He, however, did not seem to have seen the type series of *T. cilitarsis*. The male type dissected is identical to the specimen illustrated by KUZNETZOV

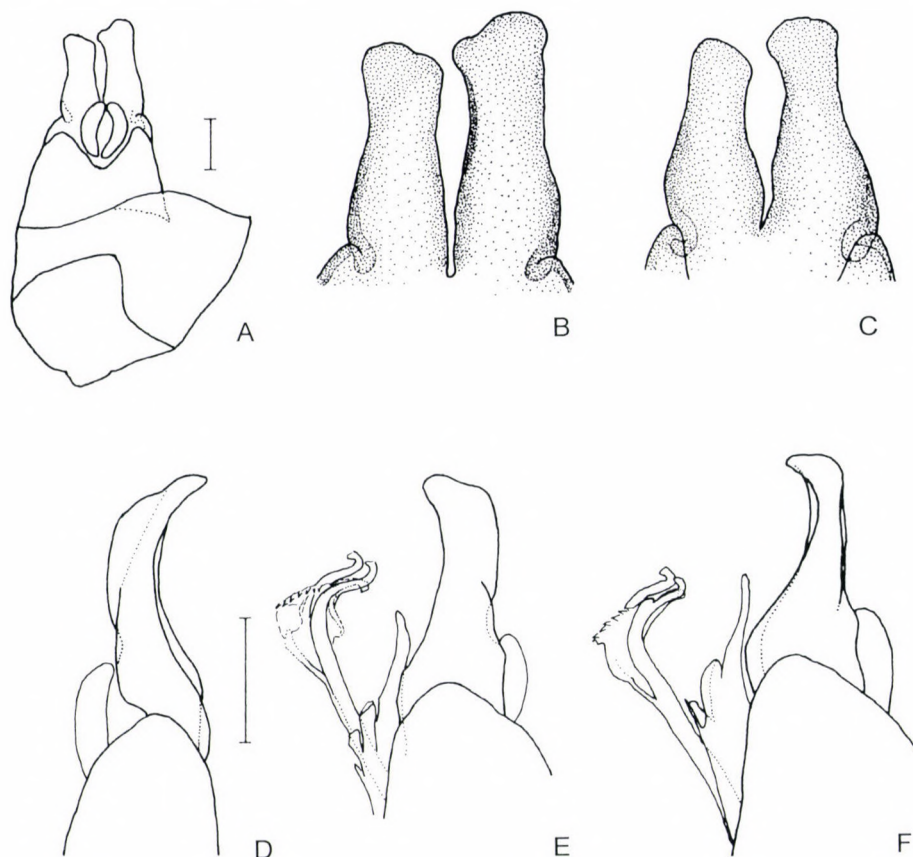


Figs 13A–F. *Tomosvaryella magyarica* sp. n., ♂ terminalia. Csévharaszt (19.VI.1968): A–B, D–E; Fülöpháza (24.V.1978): C, F. A: dorsal view; B–C: surstyli, dorsal; D: inner surstylus, lateral; E–F: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

(1993). The female type, however, has a differently shaped ovipositor with the piercer longer and straight, more like in the one shown for *T. rossica*. A lectotype for *T. cilitarsis* is hereby designated. The drawing of male genitalia shown in VON DER DUNK (1997) is somewhat indistinct but does not seem to refer to *T. cilitarsis* but more likely to *T. rossica*.

STROBL apparently seem to have had the intention to publish the species under the name of *cilipes*. The latter is indicated on the labels but crossed out in one and changed into *clitarsis*. The name *cilipes* is also the one found in STROBL's catalogue (copy received, courtesy of Dr J. GÖTZE).

Distribution. Widely distributed in Europe, but at least in western Europe restricted to certain ecological habitats (cf. above).



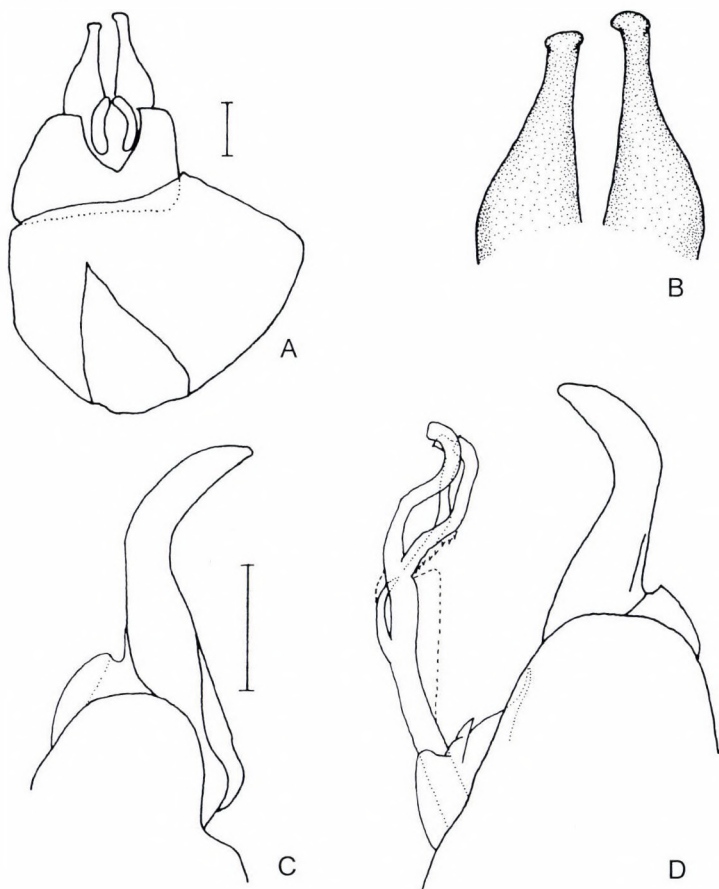
Figs 14A–F. *Tomosvaryella geniculata*, ♂ terminalia. Bükk Mountains: A–B, D–E; Gyenes-Diás: C, F. A: dorsal view; B–C: surstyli, dorsal; D: inner surstylus, lateral; E–F: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

T. littoralis (BECKER, 1898)
(Figs 2, 16B)

Pipunculus littoralis BECKER, 1898: 86.

Type material: Syntypes, 1 ♂, Germany, Sylt, 21.VII, 32578, lectotype designation by COLLIN but apparently (cf. remarks below) not published; 1 ♂, Germany, Amrum, 3.VIII, 32981, paralectotype designation by COLLIN but not published (MNHU).

Other material examined: Belgium: Koksijde Bad, 2 ♂♂ 2 ♀♀, 17.VII.1933; 2 ♀♀, 1–12.IX.1931, M. Goetghebuer; Knokke, 1 ♂, 17.IX.1925; 1 ♂, 23.V.1937, M. Goetghebuer; 1 ♀, 15.VIII.1947; 1 ♂ 1 ♀, 23.V.1948; 1 ♂, 3.VI.1951, M. Bequaert; 3 ♂♂, 19.VII.1933, 1 ♀, 18.VI.1937, A. Collart; De Panne, 1 ♀, 15.VI.1960, M. Bequaert; Nieuwpoort, 2 ♂♂ 1 ♀, 16.VI.1937, A. Collart; Wenduine, 1 ♀, 15.VIII.1954, M. Bequaert (all KBIN). The Netherlands: 1 ♂, Valke Nisse, 26.VII.1967, B. van Aartsen (KBIN); 1 ♂, Bergen Duinenreservaat, 18.VII.1982, B. Brugge (KBIN).



Figs 15A–D. *Tomosvaryella mutata*, ♂ terminalia. Bugac (17.IX.1980). A: dorsal view; B: surstyli, dorsal; C: inner surstylus, lateral; D: outer surstylus, phallic guide and ejaculatory duct, lateral. Scale: 0.1 mm

Male – Head. Third antennal segment acuminate; yellow-brown with paler fringe. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance equal to half the length of ocellar triangle (approx. 4 ommatidia; one specimen from Koksijde Bad, Belgium with eyes narrowly separated). Occiput, upper half greyish brown pollinose, subshining black; lower half more densely with silver-grey pollinosity.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) greyish brown pollinose, along anterior margin more densely silver-grey. Scutellum greyish brown, subshining black. Dorsocentral hairs short, pale, anteriorly somewhat longer.

Legs black, knees with basal third to fourth of tibia yellow; tarsal segments yellow or yellow-brown, last tarsal segment somewhat darker. Fore and mid legs posteriorly somewhat greyish pollinose. Fore femur without basal spines. Hind trochanter with few stout spines (at least two). Pulvilli shorter or as long as last tarsal segment.

Wing. Fourth costal section at most twice as long as third costal section. Cross vein R-M well beyond middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front sparsely greyish brown pollinose, subshining black. Hairs dispersed, short and pale. Male genitalia as in Fig. 2.

Female – As male except for the following characters. Third antennal segment longer acuminate. Frons, eyes separated, densely silver-grey pollinose in lower half, in upper half less so, shining black in front of ocellar triangle and further down along lateral margins. Fore femur with two well-developed basal spines. Pulvilli about 1.5 times as long as last tarsal segment, claws twice as long. Female ovipositor as in Fig. 16B.

Remarks. This species seems to be closely related to *T. sylvatica*, and to a lesser extent to *T. cilitarsis*. The male genitalia have a very similar structure (cf. Figs 2–3). However, there are some distinct external morphological differences as outlined in the identification key and the description. Also there seems to be an ecological difference with *T. littoralis* being restricted to coastal sand dunes. All records from land inwards should be treated with caution. One of the authors (MDM) studied the syntypes while on a visit to St. Petersburg (Russia) and noticed that a lectotype and a paralectotype label were attached to the type series. COLLIN apparently designated a lectotype (presumably in 1956) but never published the designation. S. KUZNETZOV (St. Petersburg) has relabelled the syntype series and probably will publish a lectotype designation in the near future. No formal lectotype designation is therefore proposed in this paper.

Distribution. Widely distributed in Europe, but apparently only coastal.

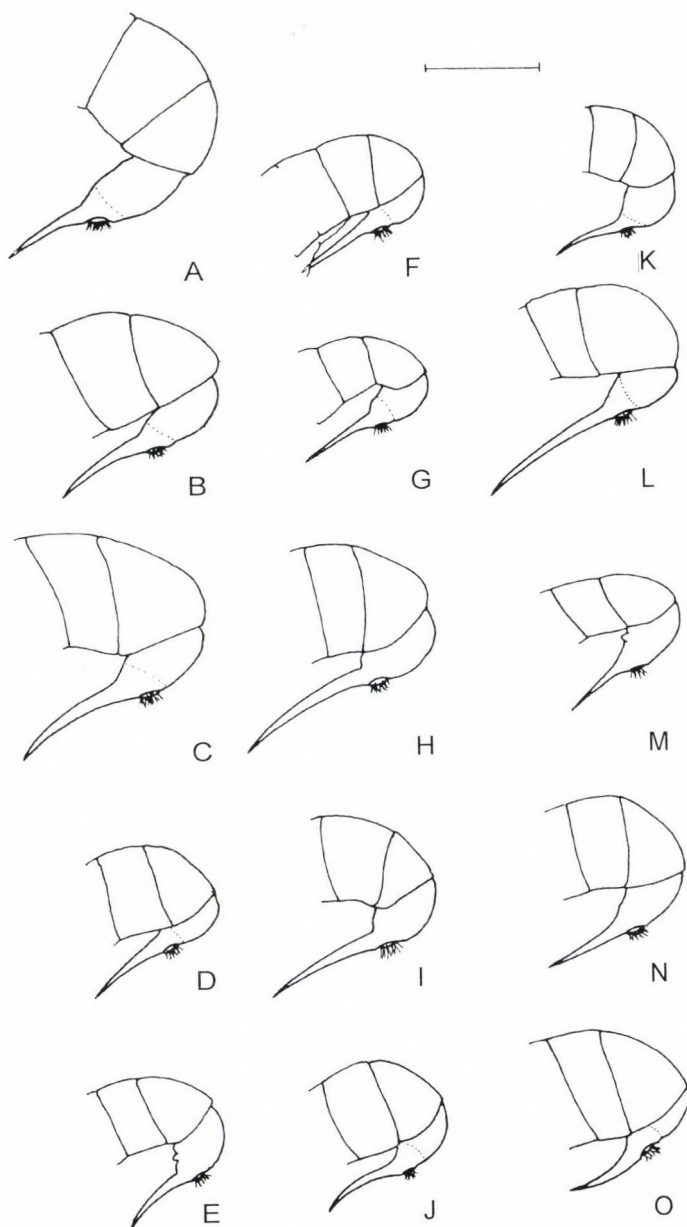
Tomosvaryella sylvatica (MEIGEN, 1824)
(Figs 3, 16C)

Pipunculus sylvaticus MEIGEN, 1824: 20.

Pipunculus scoparius CRESSON, 1911: 317. – syn.: HARDY, 1940: 101.

Pipunculus nudus var. *tangomus* RAPP, 1943: 224. – syn.: HARDY, 1947: 146.

Material examined: Belgium: 1 ♀, Brussels, Spring 1916, A. Tonnoir; 1 ♀, Genval, 19.VII.1917, A. Tonnoir; 1 ♀, Losheimergraben, 8–11.VIII.1921, G. Severin (all KBIN). Hungary:



Figs 16A–O. *Tomosvaryella* ♀ terminalia, lateral view. A: *T. cilitarsis* (Styriae, syntype); B: *T. littoralis* (De Panne); C: *T. sylvatica* (Couvert); D: *T. palliditarsis* (Crowbrough, syntype); E: ?*T. hortobagiensis*, sp. n. (Hortobágy); F–G: *T. minima* (Poland?, holotype; Holswell); H–I: *T. kuthyi* (Novi; Gyón); J: *T. israelensis* (after DE MEYER 1995); K: *T. freidbergi* (Mt. Hemron, paratype); L: *T. cilifemorata* (Zaghuan, syntype?); M: *T. magyarica* sp. n. (Csévharaszt); N: *T. geniculata* (Hoogstraten); O: *T. mutata* (St. Katharina). Scale: 0.5 mm

1 ♂, Oszla [locality: Cserépfalu], Bükk NP, 2.VI.1983, Bessenyi (HNHM). Switzerland: 1 ♂, Rochefort, 2.VIII.1988, J. P. Haenni; 1 ♀, Couvert, 26–28.VIII.1984, J. P. Jeanneret (both KBIN).

Male – Head. Third antennal segment long acuminate; brown. Face silver-grey pubescent. Frons, lower part greyish to golden, upper part shining black; eyes touching for distance equal to twice ocellar triangle (approx. 11 ommatidia). Occiput, upper half sparsely brownish pollinose, mainly subshining black, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin with different tinge but not greyish. Scutellum shining black, weakly brownish pollinose. Dorsocentral hairs short but well pronounced, dark, anteriorly somewhat longer.

Legs black, knees with basal third to fourth of tibiae yellow. Tarsal segments brownish. Fore femur without basal spines, occasionally with one poorly developed. Hind trochanter with several short spines (at least four). Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section 2 to 2.5 times third costal section. Cross vein R-M well beyond middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front tergites black-brown shining, sparsely brownish pollinose. Hairs dispersed, short but well pronounced, black; tergite 5 with somewhat longer hairs. Male genitalia as in Fig. 3.

Female – As male except for the following characters. Frons, eyes separated; silver-grey pollinose except in front of ocellar triangle for length equal to twice ocellar triangle, along lateral margins somewhat farther down. Basal spines on fore and mid femora well-developed. Pulvilli and claws about 1.5 times as long as last tarsal segment. Female ovipositor as in Fig. 16C.

Remarks. The most common and widely distributed species of all European *Tomosvaryella* species. As indicated above, closely related to *T. littoralis* and *T. cilitarsis*. The male specimen illustrated in VON DER DUNK (1997) as *T. sylvatica* does not seem to correspond with the species concept we present here.

Distribution. Widespread: Palaearctic, Nearctic, Oriental Regions.

T. palliditarsis (COLLIN, 1931) (Figs 4, 16D)

Pipunculus palliditarsis COLLIN, 1931: 56, as new name for *P. flavitarsis* COLLIN, 1920.

Pipunculus flavitarsis COLLIN, 1920: 275, a junior primary homonym of *Pipunculus flavitarsis* Williston, 1892.

Type material: Syntypes: 1 ♂ 1 ♀, Great Britain, Crowborough, 30.VI.1903, F. Jenkinson (OUM, VC-type 99).

Male – Head. Third antennal segment acuminate; brown. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 8–9 ommatidia). Occiput, upper half sparsely brownish pollinose, mainly subshining black-brown, lower half more densely silver-grey pollinose.

Thorax. Humeri brown. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin greyish brown. Scutellum brownish pollinose, subshining black-brown. Dorsocentral hairs short, darkish, in anterior half somewhat longer.

Legs brown, knees with basal third to fourth of tibiae yellow. Tarsal segments yellow, last tarsal segment brown. Fore femur with two basal spines. Hind trochanter without spines. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section almost twice as long as third costal section. Cross vein R-M at middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front tergites subshining black-brown, weakly brownish pollinose. Hairs dispersed, short, well-developed and darkish. Male genitalia as in Fig. 4.

Female – As male except for the following characters. Frons, eyes separated; silver-grey pollinose except in front of ocellar triangle for length equal to triangle, along lateral margins somewhat farther down. Basal spines on fore femur well-developed. Pulvilli and claws about 1.5 times as long as last tarsal segment. Female ovipositor as in Fig. 16D.

Remarks. This species can be differentiated readily from all other *Tomosvaryella* species by the dark humeri. Despite of this, it is similar to the *T. sylvatica* group (comprising *T. sylvatica*, *T. cilitarsis* and *T. littoralis*) in terms of male genitalia. It has also a narrow membranous area, elongated surstyli and short phallic guide. Although it should be considered that the shape of the ejaculatory duct is different from the other three species.

It is apparently an uncommon species, which is only represented by a few specimens in collections. Since the majority of the syntypes could not be studied, the designation of a lectotype has to be postponed.

Distribution. Reported from Belgium, Czech Republic, Germany, Spain, Great Britain, Latvia, Sweden, Slovakia.

Tomosvaryella minima (BECKER, 1898)
(Figs 5, 16F-G)

Pipunculus minimus BECKER, 1898: 85.

Alloneura rondanii COLLIN, 1945: 3. **syn. nov.**

Type material: Holotype: 1 ♀, Poland (?), [small handwritten label] “1/849” [small printed label] “Coll. / H. Loew”, [separate printed label] “11537” [separate handwritten label] “minimus / Beck”. (MNHU) (see remarks below for status of specimen).

Type *T. rondanii*: Holotype: 1 ♂, Italy (?), (UMO, VC-type 651).

Other material examined: Great Britain: 1 ♂, Norfolk, Ringmore, 29.VII.1953; 1 ♂, Barton Mills, 12.V.1934; 1 ♂ 1 ♀, Blackeney Point, 17.VII.1920; 1 ♂, Norfolk, Holme by Sea, 8.VI.1950; 1 ♂, Norfolk, Winterton, 18.VII.1930; 1 ♀, Holswell [writing not clear], “swept from rye”, 8.VI.1941 (all UMO). Hungary: 1 ♂, Tompa, Felsőászkalapos, 13.VI.1962, Zsirkó (KOZ); 1 ♂, Gyón, 30.VII.1904, Kertész; 1 ♂, Gyón, 23.VII.1904, Kertész; 1 ♂, Mezőtúr, 29.VII.1957, Jermy; 1 ♂, Fülöpháza, sand dunes, 8.V.1978, L. Papp; 1 ♂, Fülöpháza, sand dunes, 10.V.1978, Draskovits; 1 ♂ Bugac, 1977, Móczár (all HHNM); 1 ♂, Deliblát, 17.VI.1921, Kertész, 45329 (MNHU). Rumania: 1 ♂, Orsova, 1909, Újhelyi. The Netherlands: Nunspeet, 1 ♂, 26.V.1977; 1 ♀, 29.V.1977; 1 ♂, 13.VI.1977, R. Simon Thomas (KBIN).

Male – *Head.* Third antennal segment acuminate; brown with whitish fringe. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance

almost equal to ocellar triangle (approx. 4–5 ommatidia; one specimen in UMO collection has separated eyes). Occiput, upper half subshining black-brown, greyish brown pollinose, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) dark brownish pollinose, along anterior margin silver-grey. Scutellum brownish pollinose, posteriorly more greyish. Dorsocentral hairs short, pale, anteriorly somewhat longer.

Legs black, knees with basal fourth to fifth of tibiae yellow. Tarsal segments dark brown. Front femur without distinct basal spines, at most two stouter hairs. Hind trochanter with at most two stout hairs. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section about twice as long as third costal section (length variable). Cross vein r-m just beyond middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front tergites subshining black-brown, brownish pollinose on centre. Lateral margins extensively greyish pollinose. Hairs dispersed, short and dark. Male genitalia as in Fig. 5.

Female – As male except for the following characters. Third antennal segment sometimes more yellow-brown. Eyes separated. Frons silver-grey pollinose, less densely so in front of ocellar triangle. Fore femur with two and mid femur with single basal spine. In holotype *T. minima*, tarsal segments (except last segment) more yellow-brown. Pulvilli at least as long as last tarsal segment, usually about 1.5 times longer. Female ovipositor as in Figs 16F–G.

Remarks. The identity of *T. minima* has been problematic. Specimens, identified as *T. minima* by different authors, have after detailed study of the male genitalia, proved to belong to different species. *T. minima* males, however, show a certain variation in the shape of male genitalia, especially surstyli. This variation is illustrated in Figs 5B–D. An unambiguous redescription and detailed study was therefore deemed necessary. Matters were further complicated by the fact that the single type of *T. minima* was considered lost.

T. minima was described by BECKER (1898) from a single female “der Loew’schen Sammlung vom Jahre 1849; wahrscheinlich aus Posen”. Later (BECKER 1900) after having collected other specimens in company with *T. littoralis*, he considered the former as the female of the latter and placed both species in synonymy. *T. littoralis* was described from the male only. This synonymy has been followed by ACZÉL (1944) in his revision of the genus *Tomosvaryella*. COLLIN (1920), however, considered both as distinct species, and indicated the fact that they can co-occur in sand dunes near the sea coast. ACZÉL (1944), COLLIN (1920) as well as copies of notes and correspondence of COLLIN with Dr PEUS (former curator at MNHU, put at our disposal courtesy of Mr M. ACKLAND, Kidlington), seem to indicate that none of them saw the type of *T. minima*.

Earlier correspondence by one of the authors (MDM) with the curators of the MNHU, indicated that the type of *T. minima* may have been lost. This status was as such indicated in the world catalogue of Pipunculidae (DE MEYER 1996). However, among the material in the Berlin Museum, under *T. minima*, there is one female specimen labelled as follows: small rectangular label with [hand-written] “1/849” [could also be interpreted as “2/849” or “4849” but unlikely], second printed label with “Coll. H. Loew”, and two separate labels, one with num-

ber [printed] "11537" and one [hand-written] "minimus Beck.". According to M. KOTRBA (pers. comm.) the number 11537 refers to the catalogue of the main collection of MNHU where is stated that this number corresponds with "Pipunculus minimus, Th. Beck. 1". The specimen corresponds with the description given for *minimus* by BECKER (1898), except for the "hellen Tarsen" which are not conspicuously pale in the specimen. Although not labelled as such, the above mentioned specimen seems to be the type of *T. minima*. It largely fits the description, and the scarce information on the labels corresponds to the equally scant data given in the original description. This female specimen differs from females usually identified as *T. littoralis* by the shape of the ovipositor (straight piercer in *T. minima*, as indicated already in BECKER (1898) while slightly curved in *T. littoralis*) and the pale hairs on the abdominal tergites in *T. littoralis* (dark in *T. minima*). *T. littoralis* is described from two males originally. Since *T. minima* has been described from a single female, male identification has to rely on males associated with females that are similar to the *T. minima* type. This was done for series from Great Britain and the Netherlands. For these groups, the males of *T. minima* were clearly different in external morphology from males of *T. littoralis* and these differences are outlined in the descriptions given here. The male genitalia are also different, with *T. littoralis* showing much similarity to those of *T. sylvatica*. We can therefore confirm that *T. minima* and *T. littoralis* are two different species.

These males, identified as *T. minima*, however, are similar to the male type of *T. rondanii*. *T. rondanii* was a name given by COLLIN (1945) for a specimen in BIGOT's collection and labelled "*Alloneura flavipes*". The naming of this specimen was deemed necessary by COLLIN since it concerned here a specimen that originally came from Rondani's collection and that could have belonged to the original series used by Rondani to describe the genus *Alloneura* (now suppressed by the ICZN, COLLIN (1945) with a more detailed discussion on this matter). The type is only labelled as originating from Europe, but might be from Italy given RONDANI's nationality. COLLIN (1945) pointed out that the species is identical to *T. minima* except for the frons which is "brownish-black above the antenna, only silvery on front margin, and on a short slender median line in front". In *T. minima* the frons is completely silvery. The type of *T. rondanii* was redescribed by KUZNETZOV (1994) and the male genitalia illustrated. One of the authors (MDM) had the opportunity to study the type. The frons appears to be greased, and this could explain the brownish-black character as given by COLLIN (1945). Otherwise the type corresponds to the males usually identified as *T. minima*, including material identified by COLLIN as *T. minima*. The male genitalia are similar to one of the varieties of male genitalia that we found in *T. minima* specimens (Fig. 5B). We therefore consider both of them synonymous. KUZNETZOV (1994) mentions in his redescription that *T. rondanii* can be readily differentiated from *T. minima*

in the shape of the male genitalia. He, however, does not give details, nor does he show a diagram of the *T. minima* genitalia and there might have been a misidentification in the latter.

T. minima is further closely related to *T. sepulta* and *T. resurgens*. Both species were described originally from Spain by DE MEYER (1997). We also saw specimens collected in Montpellier (France). The females cannot be differentiated with certainty from *T. minima*. The males, however, can be clearly differentiated by the shape of the terminalia (compare Fig. 5 with drawings in DE MEYER (1997) on pp. 443 & 445). The specimen of *T. minima* illustrated in VON DER DUNK (1997) does not seem to correspond with any variation we noticed within this species but seems to refer more to a species of the *T. sylvatica* complex. *T. sepulta* and *T. resurgens* are so far only reported from the Mediterranean Region, so there can be no confusion in Central and West Europe. *T. minima*, however, does occur in Spain so there can be species confusion for female specimens in those regions.

Finally, *T. minima* is also closely related to *T. hortobagyiensis*. The males can be differentiated based on the male genitalia (Figs 5 and 6). The female of *T. hortobagyiensis* is not known with certainty (only one female is possibly associated with this new species, cf. below).

Distribution. A widely distributed but uncommon European species reported from Belgium, Germany, Great Britain, Hungary, Latvia, the Netherlands, Poland, Rumania, Slovakia, Spain, Sweden, and Switzerland as well as from Mongolia and Israel. Some of these records are confirmed (cf. material examined above) but older records for *T. minima* should be reconfirmed since there could be misidentifications among them.

***T. hortobagyiensis* sp. n.**

(Figs 6, 16E)

Material examined: Holotype: 1 ♂, HNP [Hortobágy National Park, Hungary], Újszentmargita, Margitai erdő [forest], 30.VII.1975, Malaise-trap, L. Papp. Paratypes: 1 ♂, HNP, Hortobágy, Máta, Zámusztta, 24.VI.1975, fűháló [sweeping], L. Papp; 1 ♂, HNP, Egyek, Ohati erdő [forest], 5.VI.1975, fűháló [sweeping], Máté; 1 ♂, HNP, Kunmadaras, K-i pusztta, 30.IX.1975, Draskovits; 1 ♂, HNP, Újszentmargita, Peucedanumos rét [meadow with *Peucedanum*], 24–25.VI.1975, Malaise-trap, L. Papp. All type material deposited in HHNM except for one paratype (from Újszentmargita) deposited in collection of KBIN.

Other material examined: Hungary: 1 ♀, HNP, Nagyhegyes, Vajdalahosi erdő [forest], 29.X.1975, L. Papp [previously identified by M. KOZÁNEK as *T. minima*] (HHNM).

Male – *Head*. Third antennal segment long acuminate; brown. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance equal to ocellar triangle (approx. 7 ommatidia). Occiput, upper half subshining black-brown, brownish grey pollinose, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) brown pollinose, along anterior margin greyish brown and extreme anterior silver-grey. Scutellum subshining black-brown, brownish pollinose. Dorsocentral hairs short, dark, anteriorly slightly longer.

Legs black, knees with basal fourth to third of tibiae yellow. Tarsal segments yellow-brown, last tarsal segment darker. Hind femur incrassate in distal half, posteroventrally with row of longer hairs, at most third width of femur. Hind tibia curved. Front four femora slightly greyish pollinose posteriorly. Femora and hind trochanter without basal spines. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section twice as long as third costal section. Cross vein R-M at middle of discal cell. Halter yellow.

Abdomen. Viewed obliquely from front tergites subshining black-brown, brownish pollinose. Hairs dispersed, short and dark. Male genitalia as in Fig. 6.

Female – One female specimen (also from Hortobágy NP but from Nagyhegyes) could be the opposite sex of this newly described species. It agrees in all characters with the male except for the following. Third antennal segment yellow-brown. Frons silver-grey pollinose, in front of ocellar triangle less dense. Fore and mid femora with two basal spines. Pulvilli long, 1.5–2 times as long as last tarsal segment. Female ovipositor as in Fig. 16E. However, since it was not associated with any males, we prefer not to include it in the type series. The final status will await more elaborate collecting with both sexes found associated.

Remarks. According to the male genitalia this species belongs to the *T. minima* complex. In the type series studied no variation in male genitalic structures could be seen.

Distribution. Found in Hungary in the Hortobágy National Park.

T. kuthyi ACZÉL, 1944
(Figs 7, 8, 16H-I)

Tomosvaryella kuthyi ACZÉL, 1944: 97.

Type material: Lectotype designated: 1 ♂, Pálmátér [Hungary, Békés county], 1912, Horváth, “*Tömösváryella kuthyi* det. ACZÉL M.”. Paralectotypes (all with label: “*Tömösváryella kuthyi* det. ACZÉL M.”): Hungary: 2 ♂♂, Budapest, 26.VI.1904, Kertész; 1 ♂, Gyón [today Dabas], 22.VII.1904, Kertész; 1 ♂, Kiskunhalas, 27.VIII.1937, Kuthy; 1 ♂, Szeged, 15.IX.1932, Zilahi-Sebess; 1 ♂, Órszentmiklós, IX., K. Sajó; 1 ♀, Csór, 19.IX.1923, Horváth; 1 ♀, Gyón [today Dabas], 6.X.1907, Kertész; 1 ♀, Pálmátér, 1912, Horváth. Rumania: 1 ♂, Csíkszépvíz [today Frumoasa], 13.VIII.1917, Fodor; 1 ♀, Orsova, 1908, Horváth; 2 ♂♂, Moldova, 1908, Horváth. Slovakia: 1 ♂, Pelsőcz [today Plesivec], 23.VI.1915, Kertész. Croatia (all with label: “*Pipunculus meridionalis* Kertész [nomen nudum] Typus”): 1 ♂, Novi, 9.VII.1899 [in ACZÉL, 1944 noted as: 9.VIII.1899], Kertész [only head remaining; identity could therefore not be confirmed]; 1 ♂, Novi, 14.VII.1899, Kertész; 1 ♂, Novi, 12.VII.1903, Horváth; 1 ♂, Zengg, 15.VII.1899, Kertész; 1 ♀, Novi, 9.VII.1899 [in ACZÉL, 1944 noted as: 9.VIII.1899], Kertész; 1 ♀, Novi, 14.VII.1899, Kertész, [separate label, not indicated in ACZÉL, 1944:] “*Pip. sylvaticus* var. Beck. [writing not clear] nígr., det. BECKER”; 1 ♀, Novi, 19.VII.1900, Kertész, “*P. var. sylvaticus* Mg det. Th. BECKER”; 1 ♀, Novi 2.VII.1905 [in ACZÉL, 1944: 21.VII.1905]. Crete: 1 ♂, Canea, III.1906, Bíró [abdomen missing and therefore identity could not be confirmed]. All type material is deposited in HHNM.

Other material examined: Hungary: 1 ♂, Tiszatarján, 7.X.1962, S. Tóth; 2 ♂♂, Bükk Mountains, 5.X.1958, S. Tóth; 1 ♂, Újszentmargita, 1.VI.1976, T. Vásárhelyi & M. Simon; 1 ♂, Kunma-

daras, 30.VII.1975, T. Vásárhelyi & M. Simon; 1 ♂, Kunmadaras, 30.IX.1975, Draskovits; 1 ♂, Szeged, Vetyehát, 16.VIII.1995, É. Kovács (all HNHM). The Netherlands: St. Pietersberg, 1 ♂, 7.X.1986; 1 ♂, 30.VII.1988, both van Aartsen (KBIN).

Male – Head. Third antennal segment acuminate; pale brown. Face silver-grey pubescent. Frons, lower part silver-grey (sometimes golden grey), upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 8–9 ommatidia). Occiput, upper half mainly shining black-brown, weakly greyish brown pollinose, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin black ground-colour more pronounced, pollinosity with different tinge, weakly greyish brown (in Israeli specimens more distinctly greyish). Scutellum subshining black, brownish pollinose. Dorsocentral hairs short, dark.

Legs black, knees with basal fourth to fifth of tibiae yellow. Tarsal segments somewhat paler brown. No basal spines (sometimes two poorly developed spines). Hind femur with posteroventral row of longer hairs, about half as long as width of femur (sometimes longer). Hind trochanter without spines. Pulvilli shorter or as long as last tarsal segment.

Wing. Fourth costal section 2 to 2.5 times as long as third costal section. Cross vein R-M at middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front tergites subshining black-brown, brownish pollinose. Hairs dispersed, short and darkish. Male genitalia as in Figs 7–8.

Female – As male except for the following characters. Third antennal segment longer acuminate. Eyes separated, frons silver-grey pollinose, less densely so in front of ocellar triangle. Fore femur with two basal spines. Hind femur without posteroventral row of longer hairs. Pulvilli and claws broad and very long, about twice as long as last tarsal segment. Female ovipositor as in Figs 16H–I.

Remarks. The type material of *T. kuthyi* (described from a large series of syntypes) was presumed lost, as so many other species described by ACZÉL. However, a thorough search in the collections of the HNHM by one of the authors (MF) revealed the existence of at least part of the syntype series. Several of the specimens are in poor condition. The syntypes that were retrieved, are listed above and a lectotype has been designated. The following (8) syntypes could not be found and are probably lost indeed: Hungary: 1 ♂, Budapest, 26.VI.1904, Kertész; 1 ♂, Budapest, 26.VI.1904, Madarassy; 1 ♂, Recsk, 4.VIII.1880, coll. ?; 1 ♀, Nyíregyháza, 22.VII.1918, Horváth. Rumania: 1 ♀, Csíkszépvíz, 9.VI.1917, Fodor; 1 ♀, Orsova, 1908, Horváth; 1 ♀, Moldova, 1908, Horváth. Turkey: 1 ♂, Akaia, 19.VII.1906, A. Lendl.

Species recognition and delimitation in *T. kuthyi* and related species is a difficult matter. *T. kuthyi* belongs to a complex of species, with *T. freidbergi*, *T. israelensis*, *T. parakuthyi* (originally all described from Israel and the Sinai Peninsula), and *T. hispanica* (from Spain). It can be easily confused with *T. freidbergi* which is generally smaller in size and its inner surstylus looks different in lateral view (compare Figs 8D–F and 10C). See DE MEYER (1995, 1997) for short discussion on this matter and description of related species. Male *T. kuthyi* specimens, however, show a considerable variation in the shape of the male surstyli. Three main types of male genitalia were found within the syntype series. The il-

illustrated forms are extremities with numerous varieties in between. The specimens look the same externally but the variations in the genitalia are present even in specimens from the same locality. So the authors decided to take a conservative view of the species concept and to consider all of them one species. The male specimen illustrated by VON DER DUNK (1997) could arguably be accepted as one of the variations we noticed in *T. kuthyi*, although the lateral view does not seem to correspond.

Distribution. A widespread species reported from most countries in West and Central Europe; apparently absent in northern Europe. Several records need to be reconfirmed because of possible confusion with other species from this complex.

T. israelensis DE MEYER, 1995
(Figs 9, 16J)

Tomosvaryella israelensis DE MEYER, 1995: 308.

Type material: Paratypes, Israel: 1 ♂, N. Amud, 6.X.1974, A. Freidberg (KBIN); 1 ♂, Meron, 11.VI.1974, F. Nachbar (KBIN).

Other material examined: Hungary: 1 ♂, Oszla [locality: Cserépfalu], 21.IX.1982 (HNHM). Italy: 2 ♂♂, locality not specified (IPZFA). Slovakia: 1 ♂, Slovakia mer., Devínska Kobyla, 26–27.VII.1994, M. Kozánek (KOZ). Rumania: 1 ♂, Coast, Istria, 26.VI.1972, M. Chvála (KOZ); 2 ♂♂, Mehádia, 1908, Horváth; 1 ♂, Moldova, 1908, Horváth (all HNHM).

Male – Head. Third antennal segment acuminate; brown. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 8–10 ommatidia). Occiput, upper half mainly shining black-brown, weakly greyish brown pollinose, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin black ground-colour more pronounced, pollinosity with different tinge, weakly greyish brown (in some specimens more distinctly greyish). Scutellum subshining black, brownish pollinose. Dorsocentral hairs short, dark.

Legs black, knees with basal fourth of tibiae yellow. Tarsal segments yellow-brown (sometimes more yellow). No basal spines. Hind femur with posteroventral row of longer hairs, at most third width of femur. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section twice as long as third costal section. Cross vein R-M at middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front tergites subshining black-brown, brownish pollinose. Hairs dispersed, short and darkish. Male genitalia as in Fig. 9.

Female – (After original description). As male except for the following characters. Eyes separated, frons completely greyish pollinose. Hind femur without posteroventral row of longer hairs. Fore and mid femora with two basal spines. Female ovipositor as in Fig. 16J.

Remarks. Belongs to *T. kuthyi* complex. Differentiated from *T. kuthyi* by the presence of a series of long teeth on one ejaculatory ductulus (only few short teeth in *T. kuthyi*), and shape of surstyli which is much aberrant from the different forms recognized within *T. kuthyi* (compare Figs 7 and 9). The females of *T.*

israelensis and *T. freidbergi* are very similar, including shape of piercer, and can only be differentiated by the size and some slight differences (cf. key). It is likely that the female specimens of both species may be confused owing to this.

Distribution. Originally described from Israel. Here reported for the first time from Slovakia, Hungary, Italy and Rumania. Does not seem to occur in western Europe.

T. freidbergi DE MEYER, 1995
(Figs 10, 16K)

Tomosvaryella freidbergi DE MEYER, 1995: 303.

Type material: Paratypes, Israel, Mt Hermon: 1 ♂ 1 ♀, 22.V.1973; 1 ♂, 2.VIII.1982; 1 ♂, 1.VII.1986, all A. Freidberg (KBIN).

Other material examined: Hungary: 1 ♂, Lesenceistvánd, 27.VIII.1968, Mihályi; 1 ♂, Kőszeg, 10.VII.1960, Mihályi; 1 ♂, Aranyosgadány, 4.X.1987, L. Papp; 1 ♂, Aranyosgadány, 12.VIII.1968, L. Papp; 1 ♂, Keszthely, 18.VIII.1982; 2 ♂♂, Lesina, 1914, Horváth; 1 ♂, Szeged, botanic garden, 9.X.1997, Földvári; 1 ♂, Bugac, 1977, Móczár (all HNHM).

Male – Head. Third antennal segment acuminate; brown. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 8 ommatidia). Occiput, upper half mainly shining black-brown, weakly greyish brown pollinose, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin black ground-colour more pronounced, pollinosity with different tinge, weakly greyish brown (in some specimens more distinctly greyish). Scutellum subshining black, brownish pollinose. Dorsocentral hairs short, dark; well pronounced (more developed than in *T. israelensis*).

Legs black, knees with basal fourth of tibiae yellow. Tarsal segments yellow-brown (sometimes more yellow). No basal spines. Hind femur with posteroventral row of longer hairs, about half as long as width of femur. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section twice as long as third costal section. Cross vein R-M at middle of discal cell. Halter pale yellow.

Abdomen. Viewed obliquely from front tergites subshining black-brown, brownish pollinose. Hairs dispersed, short and darkish. Male genitalia as in Fig. 10.

Female – As male except for the following characters. Eyes separated, frons silver-grey pollinose, less densely so in front of ocellar triangle. Hind femur without posteroventral row of longer hairs. Fore femur with two and mid femur with single basal spine. Pulvilli and claws only slightly longer than last tarsal segment. Female ovipositor as in Fig. 16K.

Remarks. Also part of *T. kuthyi* complex. Readily differentiated from *T. kuthyi* and *T. israelensis* by its generally smaller size, very slender surstyli, and shape of outer surstylus in lateral view (base not broadened, cf. Figs 8D-F and 10C).

Distribution. Spain, Egypt, Israel. Here reported for the first time from Hungary.

T. cilifemorata (BECKER, 1907)
(Figs 11, 16L)

Pipunculus cilifemoratus BECKER, 1907: 254.

Pipunculus argyrosticus STROBL, 1909: 210. – syn.: ACZÉL, 1944: 83.

Material examined: Tunisia: 1 ♀ (possible syntype, cf. below), Zaghuane, 52964 (NMHU). Switzerland: Visperterminen, 1 ♂, 22.VII.1992, B. Merz (KBIN); 1 ♂, 21.VII.1993, B. Merz (KBIN).

Male – *Head*. Third antennal segment acuminate; dark brown with silvery fringe. Face silver-grey pubescent. Frons, lower part silver-grey, upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 9 ommatidia; sometimes less and approx. 6 ommatidia or equal the length of ocellar triangle). Occiput, upper half shining black, lower half silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) dull black, not pollinose except along anterior margin greyish brown. Scutellum dull black, anterior margin slightly pollinose. Dorsocentral hairs short and dark, anteriorly somewhat longer.

Legs completely black, at most knees somewhat brownish. All tibiae and femora with conspicuous silvery patches, especially posteriorly. Hind trochanter also conspicuous silvery, without spines. Hind femur ventrally with posterior row of longer dark hairs, especially on distal half where at least as long as width of femur. No distinct basal spines, front femur with two stouter hairs only basally. Pulvilli shorter or as long as last tarsal segment.

Wing. Fourth costal section slightly more than twice as long as third costal section (sometimes less). Cross vein R-M distinctly beyond middle of discal cell. Halter black.

Abdomen. Viewed obliquely from front shining black, except tergites 1–2 with anterior half silvery pollinose. Lateral margins more brownish pollinose. Hairs dispersed, short and dark. Male genitalia as in Fig. 11.

Female – (Based on female from Zaghuane, Tunisia). As male except for the following characters. Eyes separated, frons completely silver-grey pollinose, except in front of ocellar triangle less so, subshining black. Dorsocentral hairs well-developed. Fourth costal section about four times as long as third section. Front femur with two basal spines. Hind femur with row of hairs posteriorly but not as strikingly long as in male. Pulvilli and claws about 1.5 times as long as last tarsal segment. Female ovipositor as in Fig. 16L.

Remarks. The male can be differentiated from other *Tomosvaryella* species by the presence of long hairs on hind femur and the black halter. It can, however, be related or synonymous with *T. nigronitida* COLLIN, 1958 (described from one female specimen found at Korcula, Croatia, and also reported from Spain and Israel) which has also black halteres and “hind femora with a complete posteroventral row of hairs which are rather longer towards tip” according to the subsequent description of the male by COE (1969) (see also DEMPEWOLF & CÖLLN 1996 for short discussion on synonymy). The male genitalia correspond with the illustration given by DEMPEWOLF & CÖLLN (1996). The identity of the female could not be asserted with certainty. *T. cilifemorata* was described from a syntype series of both sexes with type locality Tunis. One of the authors (MDM) saw one female specimen from the MNHU collection which could belong to the syntype series. It

concerns a specimen from Zaghuane (a region in Tunisia, south of Tunis) which is labelled with a red printed label "Typus". However, several of BECKER's specimens were erroneously labelled as types by ENDERLEIN (see DE MEYER 1996 and subsequent notes) so it is not sure that this actually belongs to the syntype series. According to KUZNETZOV (pers. comm.) this is the only specimen in the MNHU collection. The female specimen differs from the male from Switzerland in the characters listed above. The female ovipositor is shown in Fig. 16L but the original drawing was made without drawing tube and therefore is not as accurate as the other figures given. A female ovipositor is illustrated by VON DER DUNK (1997) but this differs from the drawing illustrated here. The original description of *T. nigronitida* mentions a long and straight piercer while the female specimen from Tunisia has a slightly downcurved piercer. Also the frons is largely pollinose (only subshining in front of ocellar triangle) while it is brightly shining black for two-thirds in *T. nigronitida* according to the original description. It is not sure whether the specimen included here is the actual female of *T. cilifemorata*. A thorough search and study of type and other material (preferably associated males and females) of all presumed species should be undertaken to clear the exact identity of this specimen and its synonymy.

Distribution. Reported from Austria, Bulgaria, Germany, Switzerland, Spain, Hungary, Tunisia.

T. coquilletti (KERTÉSZ, 1907)
(Fig. 12)

Pipunculus coquilletti KERTÉSZ, 1907: 582.

Pipunculus proximus CRESSON, 1911: 318. – HARDY, 1940: 101

Pipunculus nudus RAPP, 1943: 223. – syn.: HARDY, 1947: 146.

P. c. flaviantenna HARDY et KNOWLTON, 1939, as *P. proximus* var. *flaviantennus* HARDY & KNOWLTON, 1939: 118.

Material examined: Hungary: 1 ♂, Csévharaszt, 19.VI.1968, Soós (HNHM). Czech Republic: 3 ♂♂, Moravia, Znojmo, 13.VIII.1968, T. Gregor (KBIN).

Male – *Head*. Third antennal segment long acuminate; brown or yellow-brown. Face silver-grey pubescent. Frons, lower part more golden coloured, upper part shining black; eyes touching for distance equal to ocellar triangle (approx. 6 ommatidia). Occiput, upper half sparsely greyish brown pollinose, subshining black, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin with different tinge but not greyish. Scutellum brownish pollinose. Dorsocentral hairs short, darkish.

Legs black, knees with basal third to two-fifth of tibiae yellow. Tarsal segments yellow or yellow-brown, last tarsal segment darker. Fore and mid femora posteriorly greyish pollinose but not striking. Fore femur without basal spines. Hind trochanter with few spines (at least two). Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section about twice as long as third costal section. Cross vein r-m just beyond middle of discal cell. Halter pale yellow, sometimes stem partly darkened.

Abdomen. Mainly shining black-brown, weakly brownish pollinose. Hairs dispersed, short and dark. Male genitalia as in Fig. 12.

Female – No female material could be studied. According to ACZÉL (1944) females from *T. coquillettii* cannot be differentiated from *T. sylvatica* females.

Remarks. The male is easily characterised by the epandrial groove.

Distribution. Widespread in the Nearctic, Palearctic, and Oriental Regions. In Europe apparently restricted to Central Europe.

***T. magyarica* sp. n.**

(Figs 13, 16M)

Type material [all males previously identified by M. KOZÁNEK as *T. kuthyi*]: Hungary, Oszla [locality: Cserépfalu], holotype: 1 ♂, 21.IX.1982 (HNHM). Paratype: 1 ♂ (KBIN), 1 ♀ [previously identified by M. KOZÁNEK as *T. coquillettii*] (HNHM), same data as holotype; 1 ♂, Oszla [locality: Cserépfalu], 22.IX.1982. All type material returned to HNHM except one paratype (male, 21.IX.1982) deposited in the collection of KBIN.

Other material examined: Hungary [all males previously identified by M. KOZÁNEK as *T. kuthyi*]: 2 ♂♂, Csévharaszt, rét [meadow], 19.VI.1968, Soós; 1 ♂, Csévharaszt, 26.VI.1981, Draskovits; 2 ♂♂, Csévharaszt, nyíres [forest with birch], 11.VIII.1971, Mihályi; 1 ♂, Csévharaszt, 10.VII.1989, Draskovits; 1 ♂, Csévharaszt, nyíres, 11.VIII.1971, L. Papp; 1 ♀, Csévharaszt, borókás [Juniperus bush], 23.V.1972, Mihályi; 2 ♀♀, Csévharaszt, nyíres, 23.V.1972, Mihályi; 1 ♂, Csévharaszt, 19.VI.1972, Holló [broken surstyli]; 2 ♂♂, Csévharaszt, 10.VII.1982, Draskovits [damaged surstyli]; 2 ♂♂, Fülöpháza, 24.V.1978, L. Papp; 1 ♂, Fülöpháza, 23.V.1978, Kaszab & L. Papp; 1 ♂, Fülöpháza, 23.V.1978, Draskovits; 1 ♂, Tompa, 7–8.VII.1959, S. Tóth; 1 ♂, Peszér, 8.VII.1957, Jermy; 1 ♂, Ágasegyháza, 10.VI.1970, Mihályi (all HNHM). Switzerland: 1 ♂, Visperterminen, 21.VII.1993, B. Merz [previously identified by MDM as *T. minima*] (KBIN).

Male – *Head.* Third antennal segment long acuminate; brown. Face silver-grey pubescent. Frons, lower part silver-grey to golden-grey, upper part shining black; eyes touching for distance equal to 1.5 times ocellar triangle (approx. 8 ommatidia). Occiput, upper half mainly subshining black-brown, weakly brownish pollinose, lower half more densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) dark brown pollinose, along anterior margin greyish brown and extreme anterior silver-grey. Scutellum subshining black-brown, brownish pollinose. Dorsocentral hairs short, dark, anteriorly slightly longer.

Legs black, knees with basal third of tibiae and distal margin of femora broadly yellow. Tarsal segments yellow, last tarsal segment darker. Fore femur basally with two stout hairs, sometimes more like spines. Front four femora posteriorly weakly greyish pollinose. Pulvilli shorter than last tarsal segment. Hind trochanter without spines.

Wing. Fourth costal section at most twice as long as third costal section. Cross vein R-M at or just before middle of discal cell. Halter yellow, stem with basal half dark.

Abdomen. Viewed obliquely from front tergites subshining black-brown, brownish pollinose. Hairs dispersed, short and dark. Male genitalia as in Fig. 13.

Female – As male except for the following characters. Eyes separated. Frons in lower two-fifths to third silver-grey, above gradually less densely pollinose, in front of ocellar triangle for

length equal to 1.5–2 times triangle, shining black. Front femur with two basal spines. Pulvilli at most as long as last tarsal segment. Female piercer (Fig. 16M) flattened dorsoventrally.

Remarks. One of the authors (MF) studied the collections in Budapest (HNHM) and found females with a special ovipositor (two small bulbs on the inner surface of the base) which is exceptional in *Tomosvaryella*. While searching for the males among all the *Tomosvaryella* specimens of this collection (from the same locality – Csévharaszt) it turned out that also the males can easily be differentiated by the genitalia from other *Tomosvaryella* species (Fig. 13). Especially the phallic guide is very peculiar in shape, being apparently split longitudinally.

Etymology. Magyarica refers to the Hungarian name of the word Hungarian.

Distribution. Material was seen from Hungary and Switzerland.

T. geniculata (MEIGEN, 1824)
(Figs 14, 16N)

Pipunculus geniculatus MEIGEN, 1824: 20.

Pipunculus nigritulus ZETTERSTEDT, 1844: 957. – syn.: VERRALL, 1901: 120.

Pipunculus nigritulus var. *griseiformis* STROBL, 1899: 147. – syn.: BECKER, 1921: 166.

Pipunculus griseipennis VERRALL, 1900: 11 [error].

Pipunculus gamponyx COLLIN, 1920: 275 [unavailable name].

Material examined: Hungary: 1 ♂, Jósvalő, 18.VI.1990, S. Tóth; 1 ♂, Bükk Mountains, 4.VII.1958, S. Tóth; 1 ♂, Gyenes-Diás, 1912, Horváth (all HNHM). Belgium: 1 ♀, Hoogstraten, 31.VII.1918, G. Severin (KBIN); 1 ♂, Ortheuville (KBIN); 1 ♂, Virton, 2.VIII.1919, A. Tonnoir, (KBIN); 1 ♀, Louette St. Pierre, 1870, Gravet (KBIN).

Male – Head. Third antennal segment acuminate; dark brown with silvery fringe. Face silver-grey pubescent. Frons, lower part golden pollinose, upper part shining black; eyes touching for distance at least equal to twice ocellar triangle (approx. 10–12 ommatidia). Occiput, upper half shining black, lower half silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin with slightly different tinge but not greyish. Scutellum as centre mesonotum, weakly subshining. Dorsocentral hairs short and dark.

Legs black, knees with basal margin of tibia narrowly yellow. All tibiae and femora posteriorly, and hind trochanter somewhat greyish pollinose. Hind trochanter and fore femur without basal spines. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section 2.5–3.5 times as long as third costal section. Cross vein R-M just beyond middle of discal cell. Halter yellow, stem darker.

Abdomen. Viewed obliquely from front, brownish pollinose. Lateral margins more shining. Hairs dispersed, short and dark. Sternites with velvet like pilosity. Male genitalia as in Fig. 14.

Female – As male except for the following characters. Frons, eyes separated, densely silver-grey pollinose in lower third, gradually diminishing in density to halfway, upper half shining black. Female ovipositor as in Fig. 16N.

Remarks. Males are differentiated readily from other *Tomosvaryella* species by the velvet like sternite pilosity. If the sternites cannot be seen, it is recommended to dissect the specimen. There is some variation noted in the male genital structure (but not so frequent like in *T. kuthyi* and *T. minima*), especially in the shape of the surstyli.

Distribution. Very common European species, reported from Sweden as far as to the Canary Islands.

T. mutata (BECKER, 1898)
(Figs 15, 16O)

Pipunculus mutatus BECKER, 1898: 85.

Material examined: Hungary: 1 ♂, Bugac, 16.IX.1980, L. Papp; 1 ♂, Bugac, 17.IX.1980, Papp L; 1 ♀, Csepel, 17.IX.1899, Kertész, "P. mutatus det. BECKER; T. mutata det. ACZÉL" [covered with fungi] (all HNHM). Rumania: 1 ♀, Berzászka [today Barzaska], 1908, Horváth, "T. mutata det. ACZÉL" [covered with fungi] (HNHM). Egypt: 1 ♀, Sinai Mts, St. Katharina, 18.VII.1974, F. Kaplan (KBIN).

Male – Head. Third antennal segment acuminate; brown. Face silver-grey pubescent. Frons narrow, lower part golden-grey, upper part shining black; eyes touching for distance equal to twice ocellar triangle (approx. 12 ommatidia). Occiput, upper half shining black, lower half densely silver-grey pollinose.

Thorax. Humeri yellow-white. Mesonotum (viewed obliquely from front) brownish pollinose, along anterior margin black ground-colour more pronounced, greyish brown pollinose. Scutellum more shining black-brown, sparsely brownish pollinose. Dorsocentral hairs short, dark, very poorly developed.

Legs black, knees with basal fourth to third of tibiae yellow. Tarsal segments yellow-brown. No basal spines. Fore and mid femora posteriorly, and hind trochanter anteriorly with conspicuous greyish pollinosity. Pulvilli shorter than last tarsal segment.

Wing. Fourth costal section three to four times longer than third costal section. Cross vein R-M beyond middle of discal cell. Halter yellow.

Abdomen. Viewed obliquely from front tergites mainly subshining black-brown, weakly brownish pollinose. Lateral margins more greyish pollinose. Hairs dispersed, short and dark, poorly developed. Male genitalia as in Fig. 15.

Female – (Based on female specimen from Egypt). As male except for the following characters. Frons, eyes separated, silver-grey pollinose in lower part, shining black in front of ocellar triangle for length equal to 1.5 times triangle, along lateral margins somewhat farther down. Pulvilli as long as last tarsal segment. Female ovipositor as in Fig. 16O.

Remarks. This species was originally described from Egypt by BECKER. It occurs in some Mediterranean countries and apparently also in Central Europe. The type material could not be studied in detail. One of the authors (MDM) had the opportunity to make a preliminary study of BECKER's types while on a visit to St. Petersburg. From the draft sketches made of the male genitalia and material studied from Hungary, and Israel there seems to be some variation in the male

genitalia structure (see DE MEYER 1995 for a further discussion). Alternatively this could also be a species complex, as suggested by ACZÉL (1944). For the time being, a conservative view is taken and all material is identified as *T. mutata*.

Distribution. Reported from Spain, Egypt, Hungary, Israel(?), and Rumania. These records have to be reconfirmed when the species recognition problem is resolved.

*

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DESCRIPTION OF AN OAK GALL-WASP,
NEUROTERUS AMBRUSI SP. N.
(HYMENOPTERA, CYNIPIDAE) FROM
HUNGARY

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A new species of gall-wasp, *Neuroterus ambrusi* (Hymenoptera: Cynipidae) is described from Hungary. The newly discovered species includes males and females (and is thus bisexual), and induces catkin galls on *Quercus cerris*. We describe the adult insects and their galls, and provide some notes on biology.

Key words: cynipids, gall-wasps, *Neuroterus*, taxonomy, morphology, distribution, biology

Neuroterus HARTIG, 1840 is a Holarctic genus, with numerous representatives in the Old World (Eurasia) and in North America. Eleven species are known from Europe and all occur in Hungary (AMBRUS 1974). This genus is easily distinguished from other genera of oak gall-inducing cynipids by the absence of the transscutal fissure; the body being usually smooth and gracile, with a delicate coriaceous or alutaceous sculpturing on the mesosoma; the notauli usually being absent; and the radial cell of the fore wing being long and narrow. All the known species of this genus cause galls only on oaks in the subgenus *Lepidobalanus*, except for a single North American species, *N. chrysolepis* Lyon, which induces galls on *Quercus chrysolepis* LIEBM., a species in the subgenus *Protobalanus* (LYON 1984).

In this paper we describe a new species, *Neuroterus ambrusi*, which trophically associate with *Q. cerris*.

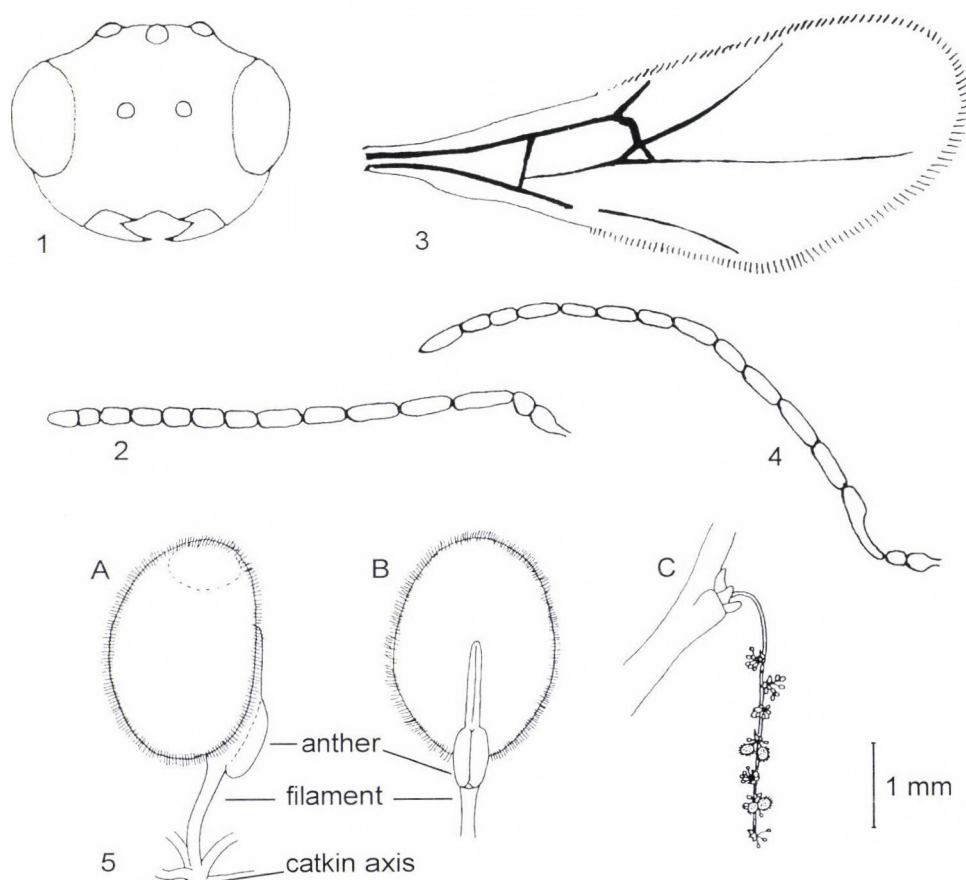
We follow the current terminology of morphological structures for the wasps (EADY & QUINLAN 1963, GIBSON 1985, RONQUIST & NORDLANDER 1989). Abbreviations for fore wing venation follow RONQUIST and NORDLANDER (1989). Additional abbreviations used here include: F1 – F12, 1st and subsequent flagellomeres; POL (post-ocellar distance), the distance between the inner

margins of the posterior ocelli; OOL (ocellar-ocular distance), the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye.

Neuroterus ambrusi sp. n.

Figs 1–5

Description. Female. Body black. Head from above 2.5–2.7 times as wide as long, as broad as thorax, gena not broadened behind eye (Fig. 1); interocular space microscopically punctate, black, broader than high; vertex microscopically punctate; distance between antennal sockets nearly equal to distance between socket and inner margin of eye; POL larger than OOL; no carina between antennal sockets; frons punctate, broader than high, black, without setae; clypeus black,



Figs 1–5. *Neuroterus ambrusi* sp. n. 1 = female head in frontal view, 2 = antenna of the female, 3 = fore wing of the female, 4 = antenna of the male, 5a = single gall, lateral view. The dotted outline indicates the usual position of the emergence hole; 5b = single gall, viewed along catkin axis. (c) 5c = whole catkin, showing relative size of mature galls. Scale bar for (a) and (b) is 1.0 mm

strongly elevated with rounded, slightly incised apex (Fig. 1); anterior tentorial pits deep; malar space short, without malar groove. Antenna 14-segmented, in some specimens suture between F11 and F12 indistinct; yellow ventrally, dark brown dorsally, longer than head and thorax together, with pale dense setae, first five segments lighter than rest; F1 as long as pedicel and scape together, as long as F2 (Fig. 2). Scutum rounded, only very slightly broader than long, smooth and shining, without trace of notauli, anterior parallel and parapsidal lines; posterior margin slightly emarginate on both sides of scuto-scutellar sulcus at base of scutellum; groove deep, microscopically punctate. Scutellum slightly longer than broad, smooth, shining, very finely punctate, without setae. Median part of propodeum uniformly sculptured, without carinae; in some specimens very indistinct median carina present. Fore wing 2.0 mm. in length, uniformly and densely hairy, longer than body, without smoky spots; wing margins strongly ciliate; veins thick, dark brown; areolet closed, distinct, triangular (Fig. 3). Coxae dark brown to black; legs yellow, except central part of femora, and pretarsi which are darker; claws without tooth. Metasoma black, smooth; in dry shrunken specimens, higher than long in side view; tip of ovipositor curved, ventral spine of hypopygium short, visible laterally, without or with a very few short sparse setae. Length 1.5–1.8 mm.

Male. Eye and ocelli larger than in female. Antenna 15-segmented, F1 more than twice as long as pedicel and scape together, strongly curved and extended posteriorly (Fig. 4). Petiole distinct, long. Similar to females in other characters.

Type material. Holotype female: HUNGARY, Tatabánya, ex catkin galls on *Quercus cerris*, G. Stone, 12.05.1997. 14 female and 10 male paratypes: HUNGARY, Tatabánya, ex catkin galls on *Quercus cerris*, G. Stone, 12.05.997.

Holotype, two female paratypes, two male paratypes and galls in the HNHM, Budapest, Hungary; two female paratypes and 2 male paratypes in The Natural History Museum, London, UK; ten female paratypes and six paratype males and galls in G. MELIKAI private collection (Hungary, Kőszeg, Systematic Parasitoid Laboratory).

Etymology. The species is named in honour of BÉLA AMBRUS, the well-known Hungarian cecidologist.

Gall structure and location. The gall is formed from a single hypertrophied anther. The mature gall is 1.5–2.0 mm long. The filament does not join the gall at its base, but noticeably to one side (Fig. 5). The remains of the anther curve around the side of the gall, forming a grooved mark which runs up one side of the gall for 60% of its height (Fig. 5). This is the only mark on the gall, and unlike other catkin galls of a similar size, there is no corresponding mark on the other side of the gall. There is also no clear point or wart either at the base of the gall, or the tip, although the tip may be slightly darker in colouration than the rest of the gall. The gall is covered with a dense coat of silvery hairs (Fig. 5). The gall is green when young, becoming golden brown when mature.

Diagnosis. Females closely resemble *N. saliens* (KOLLAR, 1857). In *N. ambrusi* the coxa and the middle 3/4 part of the femura brown, tips of femura, tibia and tarsus are yellow; the thorax is black, the metasoma darkish brown while *N. saliens* females have legs uniformly pale yellow, the body black. *Neuroterus ambrusi* males closely resembles those of *N. obtectus* (WACHTL, 1880). In *N. ambrusi* the mesopleuron with finely striation, partially shiny, while in *N. obtectus* the mesopleuron uniformly reticulate.

There are a number of other small catkin galls on *Q. cerris* induced by members of the genus *Andricus*. The bisexual generation gall of *A. vindobonensis* MÜLLNER is attached to the catkin axis in a similar manner to the galls of *N. ambrusi*, and is similarly pubescent, but unlike the galls of *N. ambrusi*, *A. vindo-*

bonensis has a distinct kidney-like shape. The bisexual generation galls of *A. quercuscalicis* BURGSDORF and *A. tinctoriusnostrus* STEFANI are both hairless, golden in colour, and rather smaller than *N. ambrusi*. The bisexual generation gall of *A. grossulariae* GIRAUD, reaching 4–5 mm in diameter, is larger than the gall of *N. ambrusi*. The gall of *A. grossulariae* also has a complex internal structure, with an airspace around the inner cell, and even when young has a reddish waxy outer surface, while the gall of *N. ambrusi* is green and pubescent when immature.

Biology. *Neuroterus ambrusi*, sp. n. induces catkin galls in the bisexual generation on *Q. cerris*. Adults emerged almost immediately after collection in May. No other known western Palaearctic *Neuroterus* species induces catkin galls on this oak host. The two other known catkin gallers in the genus *Neuroterus* are the bisexual generation of *Neuroterus quercusbaccarum* L. and the unisexual generation of *N. petioliventris* (HARTIG, 1840) (= *aprilinus* (GIRAUD, 1859) (synonym *N. schlehtendali* MAYR, 1882). Both of these species are only known to attack *Quercus petraea*, *Q. pubescens* and *Q. robur*, and have never been recorded on *Q. cerris*.

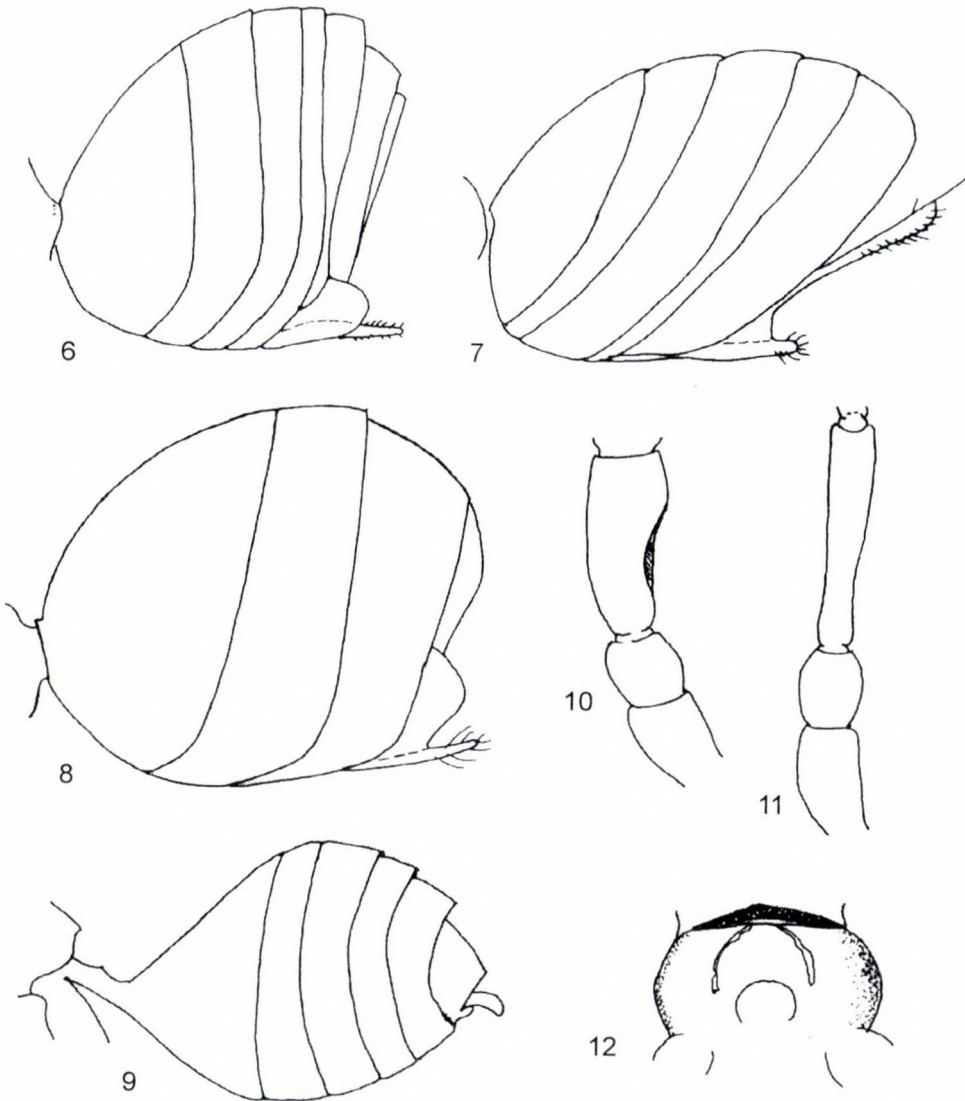
Distribution: Common in the vicinity of Tatabánya (Szárliget), central Hungary.

KEY TO THE WESTERN PALAEARCTIC SPECIES OF THE GENUS NEUROTERUS HARTIG

The key was constructed for 11 *Neuroterus* species and 16 alternate forms (unisexual and bisexual generations) distributed in Western Palaearctic. *Neuroterus aggregatus* (WACHTL, 1880) and the unisexual generation of *N. saliens* (KOLLAR, 1857) are not included into the key because no specimens were available for examination. Types of other species were revised.

- | | | |
|----|---|----|
| 1. | Female; petiole short (Figs 6–8); F1 of antenna not modified | 2 |
| – | Male; petiole long (Fig. 9); F1 of antenna modified, sometimes indistinctly (Figs 10–11) | 17 |
| 2. | Propodeum with two carinae, diverging and sharply bowed outwards posteriorly (Fig. 12); antenna with 11–12 flagellomeres; fore wing always hyaline | 16 |
| – | Propodeum without or with indistinct carinae; antenna with 12–13 flagellomeres; fore wing sometimes with fuscous patch surrounding 1st abscissa of radius | 3 |

3. Hind tarsal claw simple, without basal lobe (Figs 13–14) 4
- Hind tarsal claw with basal lobe (Fig. 15) 11



Figs 6–12. 6–9 = gaster in lateral view: 6 = *N. numismalis*, unisexual female, 7 = *N. laeviusculus*, unisexual female, 8 = *N. laeviusculus*, bisexual female, 9 = *N. quercusbaccarum*, male. 10–11 = basal segments of antenna, male: 10 = *N. petioliventris*, 11 = *N. quercusbaccarum*. 12 = propodeum, *N. laeviusculus*, bisexual female

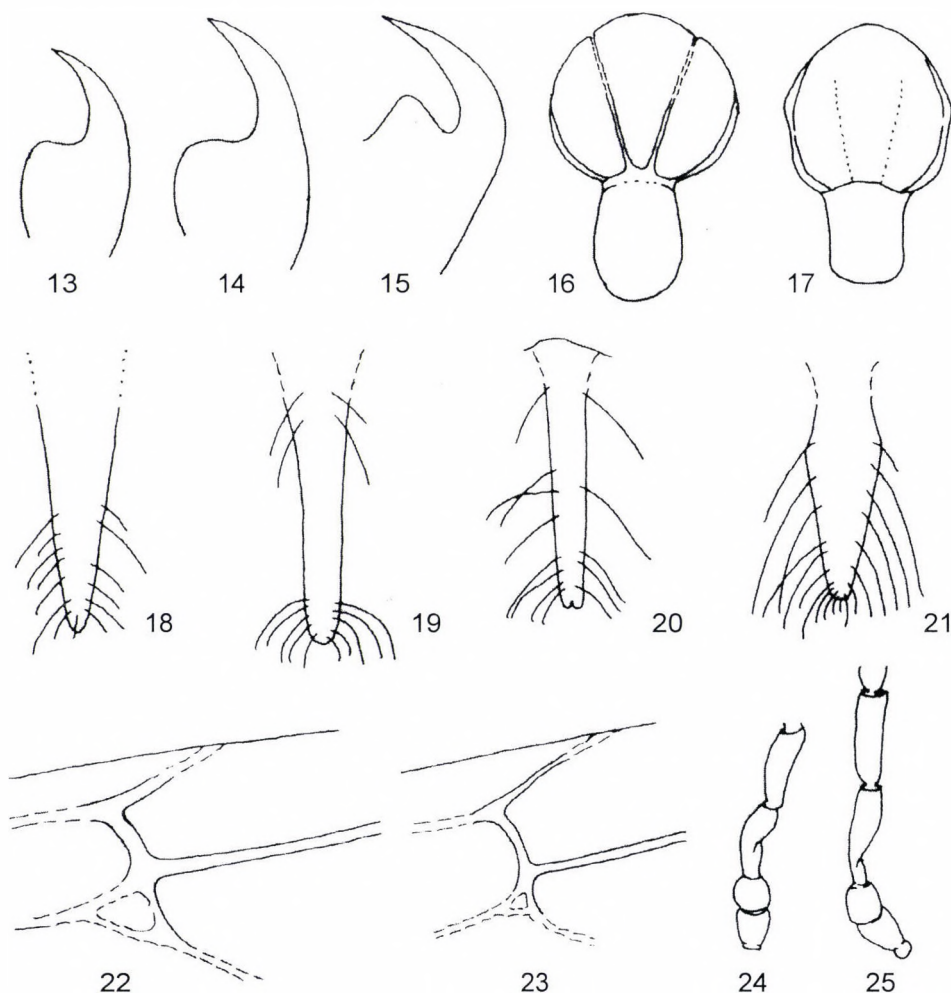
4. Scutum and scutellum densely pubescent
N. macropterus (HARTIG, 1843), unisex. gen.
- Scutum and scutellum without or with few sparse setae 5
5. Notauli deep, complete, reach pronotum 6
- Notauli absent, weak, or incomplete 7
6. Malar groove present *N. tricolor* (HARTIG, 1841), unisex. gen.
- Malar groove absent *N. lanuginosus* GIRAUD, 1859, unisex. gen.
7. Notauli weak or incomplete *N. tricolor* (HARTIG, 1841), bisex. gen.
- Notauli absent 8
8. Scutum and scutellum alutaceous or weakly coriaceous
N. obtectus (WACHTL, 1880), bisex. gen.
- Scutum and scutellum smooth and shining 9
9. Legs brown; body darkish brown *N. minutulus* GIRAUD, 1859, unisex. gen.
- Legs entirely or partially yellow, body or at least mesosoma black 10
10. Legs pale yellow; body black *N. saliens* (KOLLAR, 1857), bisex. gen.
- Coxa and middle 3/4 part of femura brown, tips of femura, tibia and tarsus yellow; mesosoma black, metasoma darkish brown
N. ambrusi, sp. n., bisex. gen.
11. Prominent part of ventral spine of hypopygium long, slender, with sparse long setae, if apically form a weak tuft than setae short, curved and fine (Figs 18–20); metasoma usually lenticular, shorter than head and mesosoma together (Fig. 6); fore wing with fuscous patch around 1st abscissa of radius, and usually another based in middle of wing 12
- Prominent part of ventral spine of hypopygium short, broader at base, with straight setae long at base of spine, and reducing towards apex, and which form with apical setae a distinct tuft (Fig. 21); metasoma ovate (Figs 7–8), sometimes longer than head and thorax together; fore wing hyaline, or with small faint and fuscous patch about 1st abscissa of radius only 15

12. Areolet of fore wing large, sometimes weakly pigmented (Fig. 22); scutellum elongated in dorsal view, rather flattened dorsally in lateral view; metasoma laterally smooth and shining; ventral spine with setae only towards apex, or with small weak apical tuft (Figs 18–19) 13
- Areolet of fore wing indistinct and(or) small (Fig. 23); scutellum ovate in dorsal view; convex dorsally in lateral view; metasoma laterally rather dull with minute obsolete sculpture; ventral spine sparsely but entirely with setae, more closely so towards apex, but not forming tuft (Fig. 20) 14
13. Notauli deep in middle and posteriorly; malar groove present; scutellum alutaceous or weakly coriaceous medially; longitudinally rugulose laterally; ventral spine with very sparse setae (Fig. 18)
N. quercusbaccarum (LINNAEUS, 1758), unisex. gen.
- Notauli weak, present only in middle, or absent; malar groove indistinct, weak; scutellum smooth or with obsolete alutaceous sculpture; ventral spine with small but distinct tuft (Fig. 19)
N. quercusbaccarum (LINNAEUS, 1758), bisex. gen.
14. Notauli incomplete, present only posteriorly; malar groove present; antenna with 13 flagellomeres
N. numismalis (GEOFFROY in FOURCROY, 1785), unisex. gen.
- Notauli absent, and (or) obsolete posteriorly; antenna with 12 flagellomeres
N. numismalis (GEOFFROY in FOURCROY, 1785), bisex. gen.
15. Malar groove present, distinct; metasoma ovate (Fig. 7), longer than head and mesosoma together; antenna with 13 flagellomeres
N. laeviusculus (SCHENCK, 1863), unisex. gen.
- Malar groove indistinct, very weak; metasoma shorter, at most scarcely longer than head and mesosoma (Fig. 8); antenna with 12 or 13 flagellomeres;
N. laeviusculus (SCHENCK, 1863), bisex. gen.
16. Tarsal claw with basal lobe; scutum smooth and shining; scutellum shining and smooth dorsally, alutaceous posteriorly; antenna with 11 flagellomeres
N. petioliventris (HARTIG, 1840), unisex. gen.
- Tarsal claw simple; scutum coriaceous; scutellum coriaceous to rugulose; antenna with 12 flagellomeres
N. petioliventris (HARTIG, 1840), bisex. gen.

Males

17. F1 equal or slightly shorter than F2 (Fig. 25) 20

– F1 longer than F2 (Figs 4, 24) 18



Figs 13–25. 13–15 = hind tarsal claw: 13 = *N. tricolor*, unisexual female, 14 = *N. tricolor*, bisexual female, 15 = *N. quercusbaccarum*, unisexual female. 16–17 = *N. tricolor*, mesosoma, in dorsal view: 16 = unisexual female, 17 = bisexual female. 18–21 = ventral spine of hypopygium, in ventral view: 18 = *N. quercusbaccarum*, unisexual female, 19 = *N. quercusbaccarum*, bisexual female, 20 = *N. numismalis*, bisexual female. 21 = *N. laeviusculus*, bisexual female. 22–23 = radial cell of fore wing, male: 22 = *N. quercusbaccarum*, 23 = *N. numismalis*. 24–25 = four first segments of antenna, male: 24 = *N. obiectus*, 25 = *N. saliens*

18. F1 strongly curved and expanded distally (Figs 4, 24) 19
- F1 straight, little constricted in proximal third, do not flattened (Fig. 11) 21
19. Mesopleuron with finely striation, partially shiny **N. ambrusi**, sp. n.
- Mesopleuron uniformly reticulate *N. obtectus* (WACHTL, 1880)
20. F1 slightly curved and expanded distally; proximal 2/3 excavate and flattened dorsally (Fig. 10) *N. petioliventrif* (HARTIG, 1840)
- F1 strongly curved and expanded distally (Fig. 25) *N. saliens* (KOLLAR, 1857)
21. All coxae, legs, petiole and basal half of 2nd tergum, yellow; tarsal claw simple *N. tricolor* (HARTIG, 1841)
- At least hind coxae, petiole, and metasoma, brown; tarsal claw with strong basal lobe 22
22. Metasoma smooth and shining *N. quercusbaccarum* (LINNAEUS, 1758)
- Metasoma in large part rather dull, very minutely and obsoletely sculptured 23
23. 2nd tergum dorsally smooth and shining, remaining terga minutely and obsoletely sculptured *N. numismalis* (GEOFFROY in FOURCROY, 1785)
- 2nd to 3rd or 4th terga dorsally and laterally minutely and obsoletely sculptured *N. laeviusculus* (SCHENCK, 1863)

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Catalogue of Palaeartic Diptera

edited by Á. SOÓS and L. PAPP

Volume 13 Anthomyiidae–Tachinidae

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Contents: Explication to distribution. Type-species designations in Volume 13. New name proposed in Volume 13. Families: Anthomyiidae (Á. DELY-DRASKOVITS). Rhinophoridae (B. HERTING). Tachinidae (B. HERTING and Á. DELY-DRASKOVITS). Bibliography. Index.

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REVISION OF THE GENUS EUGNORISMA
BOURSIN, 1946, PART V. NEW GENERA AND
SPECIES OF THE EUGNORISMA GENUS
GROUP FROM PAKISTAN AND CHINA
(LEPIDOPTERA, NOCTUIDAE)*

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The Himalayan-Sino-Tibetan taxa of the *Eugnorisma* generic complex is analysed. Three new genera, *Protognorisma* gen. n. for the *E. xestioides* species-group, *Anagnorisma* gen. n. for the *E. goniophora* species-group and *Schizognorisma* gen. n. for the *E. fuscisignata* species-group, and three new species, *Protognorisma minjakonka* sp. n. from China, *Anagnorisma zakaria* sp. n. and *Schizognorisma rhodostola* sp. n. from Pakistan are described. With 38 figures.

Key words: *Eugnorisma*, new genera, *Protognorisma*, *Anagnorisma*, *Schizognorisma*, new species, Himalayan region, Pakistan, China

INTRODUCTION

The taxonomic survey of the vast noctuid material from N Pakistan, collected mainly by Hungarian lepidopterological expeditions during the recent decade, has proved the existence of numerous undescribed species of Noctuidae in this biogeographically interesting region. The Himalayan-Sino-Tibetan region is well-known as an important area of endemism of several mono- or oligotypic genera (*Sinognorisma*, *Oligarcha*, *Monostola*, *Niaboma*, *Lasianobia*, etc.) and has played a “key role” in the evolution of several large generic complexes (e.g. the genera related to *Dichagyris*, *Xestia*, species-groups of *Eugnorisma*, etc.). In this area, the representatives of these groups regularly display numerous ancestral characters. The analysis of such genera and species often has resulted in essential changes concerning the taxonomic status of some “difficult” groups of Noctuidae

* Results of the Lepidopterological Research Project of the Himalayan Wildlife Foundation and the Hungarian Natural History Museum for the exploration of the fauna of the Deosai National Park and the Northern Areas of Pakistan, No. 1.

(e.g. the *Dasypolia* complex, the *Trichoridia-Blepharosis-Bryopolia-Bryoxena* complex, *Oncocnemis*, *Himalistra*, *Estagrotis*, *Oroplexia*, etc.).

The taxonomic relegation of some species with “xestioid” look and *Eugnorisma*-like genitalia characters has been often discussed and changed without any sufficient solution (e.g. “*Richia*” *xestioides* HAMPSON, “*Eugraphe*” *eucratides* BOURSIN). We have recognized here one of the two species mentioned above and its closest relatives as forming a “compact” monophyletic unit: the former “*Richia*” *xestioides* (nec BOURSIN, 1954), two species recently described from Nepal (*Eugnorisma lineolata* HREBLAY et RONKAY, *E. fusca* HREBLAY et RONKAY, 1998) and one new species from W China. This latter taxon, published by BOURSIN (1956) and by VARGA & RONKAY (1987) as *E. xestioides*, represents a distinct species and is described below. The earliest doubt about the statement of BOURSIN was formulated by TAMS (in. litt.) who has checked a female specimen from the series and noted that “*Richia* sp. det. W. H. T. Tams”; “Does not quite match *xestioides* Hamps. it is, I think, different”. Later, HREBLAY and RONKAY (1998), on the basis of the study of the syntypes of *xestioides*, also mentioned that *xestioides* and the Chinese species cannot be conspecific. This very characteristic, monophyletic group, consisting of four species, is described below as a new genus: *Protognorisma* gen. n. We have considered it as the sister-group of the formerly erected subgenus *Metagnorisma* VARGA et RONKAY, 1987, the latter taxon, consequently, should also be raised to generic level (stat. rev.). This phylogenetic connection explains the arboreal character and the disconnected, often relic-like geographical distribution of *Metagnorisma* species (*M. arenoflava* SCHAWERDA, *M. heuristica* VARGA et RONKAY, *M. rafidain* BOURSIN).

This case, we consider that *Protognorisma* and *Metagnorisma* are forming together the sister-group of *Eugnorisma* auct. The studies of the recently discovered western Himalayan species are pointed out that further two well-differentiated species-groups placed formerly in *Eugnorisma* form distinct taxonomic units which are considered and described here as distinct genera: *Anagnorisma* gen. n. and *Schizognorisma* gen. n. They can be characterized by some reductive apomorphic features, unlike *Metagnorisma*, because the anatomical sites and the “nature” of these reductions are different. These generic units share the lack of the spinulose field at the distal part of the vesica, while the shape and the diverticula of the vesica, the shape of the distal part of the aedeagus and also the shape of the valvae are conspicuously different (see Figs 19–26). Thus, we have to consider that the lack of the spinulose field in both species groups should be considered as homoplasies, only. Consequently, there are two different phyletic lines, in which the reduction of the spinulose field may be parallel or convergent, but both the external appearance of the moths (Figs 5–12) and the derived characters of the male genitalia are different (see the diagnoses and descriptions of the new genera and their species).

DISCUSSION

In the second part of the revision of the genus *Eugnorisma* (s. l.) (VARGA, RONKAY & YELA, 1990: 332, 342) we have pointed out that the genus *Eugnorisma* BOURSIN, 1946 should belong to the tribus *Noctuini* and it is related to the genera *Eugraphe*, *Paradiarsia*, *Protolampra*, etc. and not to *Protexarnis* MACDUNNOUGH, 1929, as suggested by BOURSIN (1946, 1954). We have also described the new genus *Pseudohermonassa* VARGA, 1990, closely related to *Eugnorisma* and *Paradiarsia*. Recently, LAFONTAINE (1998: 20–21) analysed the taxonomic and phylogenetical relationships of Noctuinae/Noctuini genera and essentially confirmed all these taxonomical results. He has outlined 9 larger, probably monophyletic “generic groups” of Noctuini, based on numerous imaginal and larval characters. The group (8), called “*Abagrotis* group” consists of 10 Nearctic/Holarctic genera: *Abagrotis*, *Adelphagrotis*, *Agnorisma*, *Parabagrotis*, *Prognorisma*, *Pronoctua*, *Protolampra*, *Pseudohermonassa*, *Setagrotis* and *Tesagrotis*. He has also mentioned, that the Palearctic *Eugnorisma* and *Sinognorisma* (latter genus as an “autapomorphic *Eugnorisma*”) should belong to the same generic group. Two new genera, *Prognorisma* and *Agnorisma* have been erected and described, and also this large and obviously rather heterogenous group has been subdivided (LAFONTAINE, 1998: 171–172). *Agnorisma*, *Eugnorisma*, *Prognorisma*, *Pseudohermonassa* and *Sinognorisma* have been characterized by having a field of spines at the apex of the aedeagus (i.e. carina) that does not extend onto the vesica, and they have been separated from the group of genera consisting of *Adelphagrotis*, *Eugraphe*, *Graphiphora*, *Opigena*, *Parabagrotis* and *Setagrotis* in which a narrow spinulose bar extends from the apex of the aedeagus onto the basal part of the vesica.

Here, we would like to briefly summarize the most important taxonomical characters, mentioned by LAFONTAINE (1998) with some comments concerning their taxonomical evaluation.

In *Eugnorisma*, the field of spines on the heavily sclerotized lamina of the carina (“apex of the aedeagus” sensu LAFONTAINE) is not “ribbon-like” and does not extend ventrally onto the vesica, as opposed to *Xestia* s. l., *Coenophila*, *Eugraphe*, *Oligarcha*, *Ammogrotis*, *Paradiarsia* and *Protolampra*, etc.* However, it may be apparently absent (probably reduced to a convex, bulbous sclerotization: *Anagnorisma goniophora* and *A. zakaria*) or strongly reduced (*Eugnorisma trigonica*-group), may appear at the ventral surface as a single thorn (*Eugnorisma chaldaica* and *E. spodia*), or a hooked, flattened crest (*Schizognorisma fuscisignata*, *S. rhodostola*) or may be apically prolonged strongly, projecting inwards

* This may prove a good evidence that “*Paradiarsia*” *glareosa* cannot regarded as *Eugnorisma* (see: FIBIGER 1997).

the basal part of the vesica (*Eugnorisma ignoratum*, *E. puengeleri*, *E. tamerlana*, *E. cuneiferum*, *E. enargiaris* and *Protognorisma fusca*, *P. lineolatum* and *P. minjakonka*).

The vesica projects ventrally as in many other related genera, which is probably only a symplesiomorphy. However, it may project dorsally just within a compact species-group as the *Eugnorisma chaldaica*-group, where *E. chaldaica* and *E. spodia* have ventral tooth at the end of aedeagus, or projecting dorso-laterally in *Schizognorisma* where the hooked process of the carina is situated ventro-laterally.

In *Eugnorisma* there are some shared characters of the vesica, e.g.: (i) the large proximal diverticulum of the vesica with an apical, not bulbed cornutus (contrasting, e.g. to *Eugraphe sigma*, further "*Eugraphe*" spp. as *marcida*, *decussa*, *funkei* and also "*E.*" *miniago*, with bulbed cornutus on a rather short diverticulum, near the "corpus" of vesica*), (ii) any "ribbon-like" dentate sclerotization of the carina does extend ventrally onto the vesica; (iii) the distal spinulose field close to the ductus ejaculatorius, which may be lacking in some species groups and related genera.

It seems to be a trend that the distal spinulose field of the vesica is lacking in those Noctuid groups, in which the ventral, ribbon-like, dentate sclerotization of carina extends onto the ventrally projected vesica. In those groups, which share the ribbon-like dentate sclerotization onto the vesica, e.g. *Paradiarsia*, *Coenophila*, *Eugraphe*, etc., also *Xestia* s. l., the lack of the spinulose field may appear as a primary character, while in the other generic group, in which the carina shows the "*Eugnorisma*"-character, but they do not have the distal spinulose field of vesica, the latter may be secondarily lost, e.g. in the genera *Anagnorisma* and *Schizognorisma*. These characters obviously correlate to the different "technics" of copulation.

There is a "subapical process" on the ventral margin of the valva, which is derived from the "ventral angle of the valva" and is not homologous with the pollex of *Xestia* which is a ventral extension of the base of the harpe ("clasper" in LAFONTAINE) that projects below the ventral margin of the valva. The "pollex"-like process of the *Eugnorisma*-group represents a modified saccular extension which is derived from the distal end of the sacculus (the transformation of this saccular extension into a pollex-like process can easily be detected by the comparison of the valvae of the species of *Protognorisma*, *Schizognorisma*, *Anagnorisma* and certain species of *Eugnorisma*). On the other hand, *Metagnorisma* has no pollex-like valval extension ventrally but has a posterior extension of the harpe (clasper) like in *Prognorisma*, although it is connected to the inner surface

* Based on this character, the Central Asiatic "*Eugraphe*" spp., as *marcida*, *decussa*, *funkei* and their sibling species seem to be more closely related to *E. sigma* (also strictly Palaearctic!) than to the Holarctic *Coenophila*.

of the valva. In addition, the scale-like vestiture of the saccular extension is a synapomorphy of some species groups in *Eugnorisma* s. str.

The matrix of the main genital features (completed with the external appearance of the taxa) is given in Table 1.

Other features used for the characterization of the genera of this complex: the third segment of the labial palpus: it is smooth in *Eugnorisma* and *Pseudohormonassa*, while *Prognorisma* and *Agnorisma* have a ventral tuft on it; in addition, one of the species of *Schizognorisma* (*S. rhodostola*) has a well-developed ventral tuft on the third segment, while this tuft is absent in the other one (*S. fuscisignata*). The scaled second segment of *Eugnorisma*, *Schizognorisma*, *Anagnorisma*, *Protognorisma* and *Metagnorisma* is characteristically axe-shaped, only its width is variable, while the segment is elongate in *Oligarcha* and *Ammogrotis*, with more or less parallel dorsal and ventral margin.

The shape of the uncus and its tip: it is apically flattened in *Agnorisma*, flat, strap-like in *Prognorisma*; various in *Eugnorisma*. This character shows different states even in very closely related species, e.g. *Eugnorisma insignata* and *E. conformis*. Obviously, it may be useful for the characterisation of some supraspecific taxa, but it is probably without any phylogenetic significance, due to parallel or convergent changes (flattened apex) in different species groups.

The presence of signa is considered as a plesiomorphic character, appearing in a few large Noctuidae groups (e.g. *Diarsia*, some Noctuini genera, etc.). The species of the Nearctic genera *Prognorisma* and *Agnorisma* have signa, four long stripes in *Prognorisma* and two or four "prominent" signa in *Agnorisma*. In the Palaearctic groups, *Sinognorisma* has four long, ribbon-like signa, *Anagnorisma* may have weak, partly interrupted signum stripes (*A. glareomima* and *A. eucratides*), *Protognorisma* and *Metagnorisma* have four modified, patch-like signa, in *Eugnorisma* s. str. and in *Schizognorisma* the signa are completely missing.

The leg spining: *Eugraphe* has four rather than three rows of setae on the basal segment of mid- and hindtibiae, the others have three rows of setae. The appearance of this "fourth" row of spines is variable within the genus *Eugraphe* (s. l.), sometimes also within a single species (e.g. in *E. sigma*). Curiously, the holotype of *Schizognorisma rhodostola* has an additional "fourth-row spine" on the basitarsus of the left hindleg while the right hindleg has only three regular rows on the same segment.

Based on these characters, some former statements and hypotheses on the phylogenetic relationships concerning *Eugnorisma* and related genera can be critically re-considered. The main questions to be answered are as follows:

1. Are the genera *Protognorisma* and *Metagnorisma* phylogenetic sister-groups?
2. What is the sister-group of [*Protognorisma* + *Metagnorisma*]?

Table 1. *Eugnorisma* character matrix

Genera	Sinognorisma	Protognorisma	Metagnorisma	Anagnorisma	Schizognorisma	Eugnorisma1	Eugnorisma2	Eugnorisma3	Prognorisma	Agnorisma	Pseudhermonassa	Oligarcha	Coenophila	Eugraphe	Eugnorismini	Paradiarsia	Xestia
xestioid habitus (0) eugnorismoid habitus (1) others (2)	1	0	1	1	1	1	1	1	2	2	2	1	2	0	0	0	0
carina: smooth or bulg (0) dentate ribbon (1) spinulose shield (2) axe-shaped (3) "rhino"-shaped (4)	0	2	2	2	4	2	3	2	2	2	2	1	1	1	1	1	1
valva: any distal process (0) with distal process (1)	1	1	0	1	1	1	1	1	0	0, 1	0, 1	0	1	1	1	0, 1	1
valva: any pollex-like (0) pollex, any scales (1) pollex with scales (2) proc. at harpe basis (3)	1	1	0	1	1	1	1	2	1	0	0	0	0	0	3	0	3
valva: falciform harpe (0) short triang. harpe (1)	0	1	1	0	0	0	0	0	0	0	1	1	1	0	1	1	1
vesica: long, tubular (0) broad, saccate (1)	0	1	1	1	1	0	0	1	0	1	0, 1	0	0	1	1	0	0

Table 1. *Eugnorisma* character matrix.

Genera	Sinognorisma	Protognorisma	Metagnorisma	Anagnorisma	Schizognorisma	Eugnorisma1	Eugnorisma2	Eugnorisma3	Prognorisma	Agnorisma	Pseudohermionassa	Oligarcha	Coenophila	Eugraphe	Eugnorismini	Paradiarsia	Xestia
vesica: any prox. div. or prox. div any corn. (0) prox. div. corn. (1) prox. div. bulb. c. (2)	0	1	1	1	0	1	1	1	0	0	0	1	0	2	2	0	0
vesica: any d. spin.f. (0) with d. spin. f. (1)	0	1	0 (1)	0	0	1	1	1	0	0	0	0	0	0	0	0	0
ductus long, tubular (0) l., t., distally folded (1) short, dist. folded (2) short, shield.like (3)	0	3	3	0	0	1	1	2	0	0	0	0	0	0	0	0	0
bursa: any signa (0) spot-like signa (1) elongate signe (2)	2	2	1	1	0	0	0	0	2	2	2	2	2	2	2	2	2

3. What are the phylogenetic relationships between *Anagnorisma*, *Schizognorisma* and *Eugnorisma*?

4. What are the taxonomic ranks of the “eugnorismoid” taxa of the Himalayan-Sino-Tibetan region and what is the geographical origin of the *Eugnorisma* genus-group?

CONCLUSIONS

We should agree with LAFONTAINE (1998), who subdivided the “*Abagrotis*” group of Xestiini based on the structure of the carina. From the 10 genera of the “*Abagrotis*” group the genera *Agnorisma*, *Prognorisma*, *Eugnorisma*, *Sinognorisma* and *Pseudohermionassa* proved to be more closely related to one another. Now, this group will be completed by the newly described and revised genera: *Protognorisma*, *Metagnorisma*, *Anagnorisma* and *Schizognorisma*.

We have to consider *Protognorisma* as closely related to *Eugnorisma*, because they share a set of “eugnorismoid” male genitalia characters: dorsal, spinulose plate of carina, aedeagus with ventrally projected vesica having basal diverticulum with not bulbed apical cornutus and spinulose terminal field, presence of pollex-like process derived from saccular extension etc. The external appearance and the female genitalia, however, show conspicuous differences. *Protognorisma* has conserved the xestioid appearance, the presence of the ventral tuft on the third segment of the labial palp, the “archetype” of “eugnorismoid” male genitalia and the plesiomorphic female genitalia with relatively simple structure of ductus and appendix bursae and corpus bursae with four signa. The latter characters of the female genitalia come close to those of *Metagnorisma*: the broad, shield-shaped ductus, the not sclerotized and not ribbed appendix bursae and the presence of signa are the important shared characters. Consequently, the shared characters of *Protognorisma* and *Metagnorisma* are mostly plesiomorphic. As opposed to *Protognorisma*, *Metagnorisma* can be mostly characterized by reductive apomorphies: lack of saccular process, lack of distal angle of valvae, reduced sclerotization of carina, saccate form of vesica with more or less reduced distal spinulose field combined with a nearly complete plesiomorphy of female genitalia. The very special, shield-shaped ductus bursae which does not occur in any related genera, however, must be regarded as a synapomorphy and crucial evidence supporting the sister-group relation of these genera.

Anagnorisma, *Schizognorisma* and *Eugnorisma* share also a set of “eugnorismoid” characters. In males: the aedeagus with ventrally projected vesica, the lack of the ribbon-like elongate ventral sclerotization of carina, the presence of the apical valval process and the pollex-like distal processus of sacculus, the falciform harpe; in females: the strongly sclerotized, tubular ductus bursae. Some

other characters display a more mosaic-like appearance: the dorsal, spinulose plate of the carina occurs in typical form in *Anagnorisma* (all species) and *Eugnorisma* (most species); the carina is strongly modified in *Schizognorisma* (with falcate and flattened ventro-lateral process), and in one species-group of *Eugnorisma* (s. str.) (*chaldaica*-group, with axe-shaped sclerotization of the carina). The basal diverticulum of vesica with not bulbed, acute apical cornutus are present in *Anagnorisma* and *Eugnorisma*, but lacking in *Schizognorisma*; the distal spinulose field of vesica occurs in *Eugnorisma*, but absent in *Anagnorisma* and *Schizognorisma*. The number, size and shape of signa are variable, preserved (in some *Anagnorisma* species) or displaying a tendency of reduction (*Anagnorisma partim*, *Schizognorisma*, *Eugnorisma*).

Several groups can be characterized by some autapomorphic characters, these are as follows: *Protognorisma*: huge basal diverticulum of wide, T-shaped vesica; strongly developed saccular process; *Metagnorisma*: rounded shape of valva; lack of saccular and distal valval process; *Anagnorisma*: huge cornutus of basal diverticulum; *Schizognorisma*: falcate and flattened ventro-lateral process of carina; huge, ribbed vesica; *Eugnorisma*: ribbed-folded ductus and rugulose appendix bursae; *E. chaldaica* species group: axe-shaped sclerotization of carina; *E. insignata* species group: scale-like vestiture (macrotricha) of saccular process.

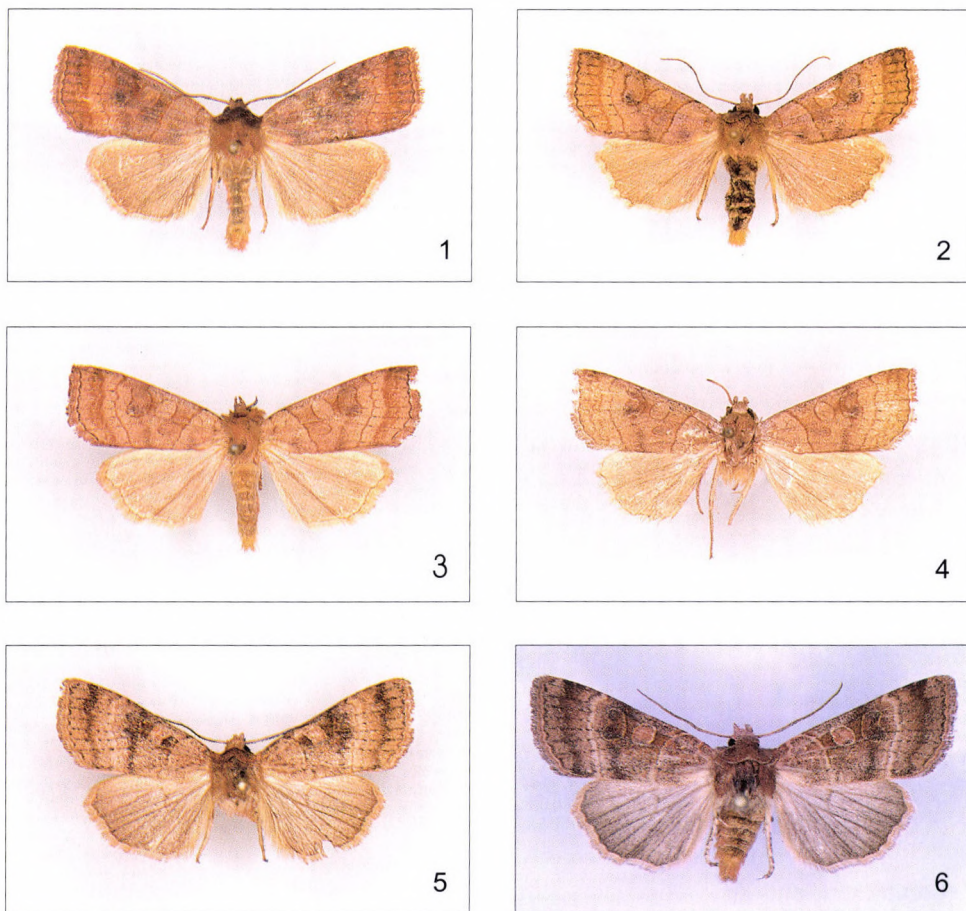
Other shared, reductive characters can be regarded only as homoplasies, e.g. the wide, saccate form of the vesica; the lack of the distal spinulose field; the reduction of the basal diverticulum and cornutus.

LAFONTAINE (1998) has characterized the monotypic genus *Sinognorisma* RONKAY et VARGA, 1987 (terminologically quite curiously) as an "autapomorphic *Eugnorisma*" and suggested a possible paraphyly of the genus *Eugnorisma* sensu VARGA et RONKAY (1987). He did not mention, however, any genus or species within *Eugnorisma* which could represent the sister-group of *Sinognorisma*. The latter genus has not only a "simplified vesica and enlarged saccus" as autapomorphies, but also has asymmetrical sacculi which is unique within all *Eugnorisma*-like supraspecific units, and the whole male genital capsula is gigantic compared with those of the other members of *Eugnorisma* (s. l.). In addition, the female genitalia have four ribbon-like signa, this probably plesiomorphic character cannot be found within *Eugnorisma*, but present, for instance, in *Protognorisma* and also in some *Eugraphe* species. On the other hand, *Sinognorisma* does not display any apomorphic characters of the female genitalia of *Eugnorisma*, e.g. the proximally strongly ribbed and folded ductus bursae with the typical "lock-and-key" characters, corresponding to the carina, diverticulum and cornutus of the male. Thus, *Sinognorisma* cannot be regarded simply as an "autapomorphic *Eugnorisma*", but it represents an own phylogenetic line with mosaic-like combination of plesiomorphic and autapomorphic characters.

Summarizing the conclusions, the phylogenetic relationships of the “eugnorismoid” genera are illustrated in a tentative cladogram (Fig. 38).

EVOLUTION AND BIOGEOGRAPHIC HISTORY OF EUGNORISMA AND RELATED GENERA

The fauna of the monsoonic orobiomes of the Sino-Himalayan region displays a transitional (oro-arboreal), ancestral character with the occurrence of numerous relic-like, mono- and oligotypical genera (RONKAY & RONKAY 1994;



Figs 1–6. 1 = *Protognorisma fusca* (HREBLAY et RONKAY), paratype, male; 2 = *P. lineolata* (HREBLAY et RONKAY), paratype, male; 3 = *P. minjakonka* sp. n., paratype, male; 4 = *P. minjakonka* sp. n., holotype, male; 5 = *Anagnorisma zakaria* sp. n., paratype, female; 6 = *A. zakaria* sp. n., holotype, male

VARGA 1996). The relic-like genera and species groups of Noctuini (e.g. *Palaeamathes*, *Paramathes*, *Hoeneidia*, *Raddea*, *Estimata*, *Erebophasma*, *Perissandria*, *Spinipalpa*, *Oligarcha*, and also *Protognorisma*, *Anagnorisma*, *Schizognorisma*, *Sinognorisma*) and the bulk of the species of the large Noctuini genera *Diarsia*, *Xestia* and *Hermonassa* belong to this faunal type. the importance of this monsoonic SE Asiatic oro-arboreal faunal type of probably Gondwanian origin is hardly to overlook in the genesis of the Palaearctic and Holarctic fauna, respectively. Hence, the new genera and species described below constitute a significant contribution to the knowledge of this highly important faunal type.



Figs 7–12. 7 = *Schizognorisma rhodostola* sp. n., holotype, male; 8 = *S. rhodostola* sp. n., paratype, female; 9 = *S. rhodostola* sp. n., paratype, male; 10 = *S. rhodostola* sp. n., paratype, female; 11 = *Anagnorisma goniophora* (HACKER, RONKAY et VARGA, 1990), female, Pakistan; 12 = *Schizognorisma fuscisignata* (HAMPSON), female, Kashmir

The Mediterranean area can also be regarded as an important area of endemism and refuge of relic-like Arboreal taxa (DE LATTIN 1949, 1957, 1967, RONKAY & RONKAY 1994, VARGA 1996). The genus *Metagnorisma* by its scattered range of distribution and the presence of some plesiomorphic characters proved to be a member of this relic-like Mediterranean arboreal fauna. Its splitting from the SE Asiatic sister-group *Protognorisma* supposedly been proceeded earlier than the Upper Miocene, because the circum-Mediterranean disjunctions of the relic-like *Metagnorisma* taxa (*M. arenoflavida*, *M. heuristica*, *M. rafidain*) can be regarded as consequences of the Late Tertiary aridity crisis.

The ancestral, oligotypic groups (genera *Anagnorisma* and *Schizognorisma*) of the “eugnorismoid” phyletic line are also restricted to the same Sino-Himalayan area, while the more derived *Eugnorisma* (s. str.) line could cross the “xeromontane filter” (VARGA 1995, 1996) and, due to this achievement, could differentiate into several species groups and many species within the newly occupied adaptive zone. This process can be characterized also by the survival of some endemic species in well-defined areas of endemism of the Palaearctic semi-arid orobiomes (e.g. some parts of the Central Asiatic mountain systems: Kopet-Dagh, Tien-Shan, Pamir and Hindukush Mts) and by the secondary expansion of the “extant” species into the steppe and semi-desert zonobiomes, followed by subspeciation, as well.

The third important process of the biogeographic history of the “eugnorismoid” genera was the crossing of the “taiga”-filter (“*Rhododendron*-filter” in VARGA 1995, 1996), which has resulted in the expansion into S Siberia, and, throughout the Beringian, also into the Nearctic arboreal zonobiomes, where also secondary differentiation processes have taken place in the genera *Pseudohermionassa* (Holarctic species + vicariant species), *Prognorisma* (*P. substrigata* in the Nearctic, *P. albifurca* in the E Palaearctic) and *Agnorisma*. This pattern of vicariance and speciation seems to be rather widespread in the tribe of Noctuini, e.g. *Diarsia*, several species groups of *xestia*, *coenophila*, *Paradiarsia*, *Protolampra*, *Graphiphora*, *Spaelotis*, etc.

DESCRIPTIONS OF THE NEW TAXA

Protognorisma gen. n.

Type species: *Richia xestioides* HAMPSON, 1903, *Cat. Lep. Phal.* IV: 596, pl. 76, fig. 14.

Diagnosis. The new genus differs from its sibling genus, *Metagnorisma*, by its more *Xestia*-like external appearance (apex more acute, outer margin slightly concave below apex, wing pattern resembling also that of some *Xestia* species,

e.g. *X. ochreago*, *X. curviplena*, *X. brunneago*, etc.). In the male genitalia, *Protognorisma* has more elongate valva with well-developed apical and pollex-like ventral extensions, less expressed prolongation of basal part of harpe and the cornutus of the vesica is considerably larger, longer, more acute. Comparing the female genitalia of the two genera, ovipositor and the ductus bursae of *Protognorisma* are stronger in sclerotization, a rather strong medial fold may be present in the latter and the signa are more or less ribbon-like, their reduction into rounded patches is much less expressed than in *Metagnorisma*.

Description. Wingspan 29–36 mm, length of forewing 14–16.5 mm. Sexes similar. Head small, eyes large, rounded, palpi with distally strongly broadened second and very small, smoothly scaled third segment. Frons broad, smooth, with large, cap-shaped tuft projecting forward, vertex also smooth, with smaller tuft. Antenna of male ciliate with fasciculate cilia, dorsal surface of axis covered with scales, antenna of female filiform, with scarce, fine cilia. Basal tuft of antenna small, less prominent. Thorax slender, vestiture rather homogenous, collar unicolorous, medium-large. Tegulae less distinct, prothoracic tuft forming narrow crest, metathoracic tuft small. Tibia of foreleg with 4–8 spines in a row at inner margin and two separate spines near apex on both margins, those of mid- and hindlegs with two rows of long 4–7 spines ventrally and ventro-laterally; basal segments of tarsi with three rows on ventral side. Abdomen slender, cylindrical, relatively short, dorsal crest reduced, anal tuft larger, usually orange-brown. Forewing elongate, narrow, with apex pointed, outer margin slightly concave below apex. Ground colour regularly ochreous-brown with variably strong pinkish- or violaceous-brown suffusion, especially in median area. Ante- and post-medial crosslines simple, rather sharply defined, former oblique, almost straight, latter fine, slightly sinuous; median fascia broad, diffuse, greyish brown. Orbicular and reniform stigmata large, rounded, fully encircled, claviform rather large, apically rounded. Subterminal line wide, double, consisting of less sinuous, interrupted inner and more sinuous, continuous outer lines. Hindwing ochreous grey, suffused with brown, veins slightly darker; cilia ochreous, spotted with brown.

Male genitalia (Figs 13–18): Uncus slender or rather strong (*minjakonka*), curved, tegumen narrow, fultura inferior weak, cup-shaped, vinculum medium-long or long, strong, V-shaped. Valva elongate, distally tapering (*minjakonka*, *xestioides*) or dilated (*fusca*, *lineolata*). Apex of valva either continuing directly in acute apical lobe (*minjakonka*) or rounded with more ventrally projecting (*fusca*, *lineolata*) or reduced (*xestioides*) apical lobe. Pollex-like extension narrow, acutely triangular. Sacculus narrow, short, harpe relatively short, thick (*fusca*, *lineolata*) or narrower, longer (*minjakonka*, *xestioides*), slightly curved, with apex pointed or finely rounded. Aedeagus long, tubular (*minjakonka*) or shorter, thicker, cylindrical (*xestioides*, *fusca*, *lineolata*), arcuate, dorsal plate of carina either long, strongly dentate, extending rather far into basal portion of vesica (*fusca*, *lineolata*, *minjakonka*) or weak, slightly dentate, short (*xestioides*). Vesica spacious, recurved ventro-laterally, subbasal diverticulum broad, short, conical, armed with strong, acute, thorn-like cornutus, terminal spinulose field large, semiglobular.

Female genitalia (Figs 27–32): Ovipositor relatively short, broad, papillae anales short, wide, slightly pointed, both pairs of apophyses rather long, slender. Ostium bursae sclerotized, short, wide, pentagonal or cordiform, ductus bursae medium-long, flattened, sclerotized, smooth (*fusca*), weakly (*lineolata*) or strongly (*minjakonka*) folded at middle, dilated proximally. Appendix bursae flattened-conical (*fusca*, *lineolata*) or broadly tubular with rounded apical part (*minjakonka*), membranous with long ribs, corpus bursae elongate-sacculiform, membranous with long wrinkles, and with four signa, either more or less equal, short, patch-like (*fusca*, *lineolata*) or three of them longer, ribbon-like, fourth short, rounded (*minjakonka*).

Taxonomic notes. *Protognorisma* differs from the genera of the supposed sister-group, *Eugnorisma* s. l. by its *Xestia*-like external appearance, the smooth surface of the pollex-like saccular process, the huge, claw-like subbasal cornutus and the very broad, saccate corpus of the vesica, and the presence of shortened, rather patch- than ribbon-like signa.

There is no reduction in *Protognorisma* in the typical male genital character set of the aedeagus and the vesica (dorsal, dentated plate of the carina, ventrally projecting, tubular vesica with subbasal diverticulum terminated in cornutus and with large spinulose distal field), while the more ancient two genera of *Eugnorisma* s. l., *Anagnorisma* and *Schizognorisma*, show different, apomorphic reductions. In *Anagnorisma* the strong dorsal plate of the carina may present or partly or fully reduced, the subbasal cornutus is present, strong but it is sitting on shortened, broad diverticulum and the distal spinulose field is absent. In *Schizognorisma*, the dorsal plate of the carina is reduced but substituted by long, hooked-falcate ventro-lateral process, the cornutus and the spinulose field are completely missing.

The characteristic features of the female genitalia of *Protognorisma* – the shortened signa and the unspecialized, less sclerotized and not or weakly ribbed appendix bursae – do not appear in this combination in the genera of *Eugnorisma* s. l., although two species of *Anagnorisma* have signa but weaker and ribbon-like. The appendix bursae is also regularly weak, membranous in *Anagnorisma* and *Schizognorisma*, where the corpus bursae is larger, more spacious, elliptical-sacculiform. In *Eugnorisma* s. str. the ductus bursae is regularly heavily sclerotized, strongly folded, the appendix bursae is usually strongly ribbed and the corpus bursae has no signa.

Bionomics and distribution. The whole range of the genus represents a large, forceps-like area from the eastern mountainous chain of the Tibetan plateau throughout the southern Himalayas westwards to Kashmir. They inhabit mostly arboreal biotopes: medium-high and higher deciduous and lower coniferous woodlands between 2000–3200 m, but they may also appear above the continuous forest belt. The imagines of the species are on the wing at the middle of the autumn (end of August–mid-October, depending on the actual locality) and are strongly attracted to artificial light. The early stages are unknown.

Species of the genus:

P. xestioides (HAMPSON, 1903) **comb. n.**

P. lineolata (HREBLAY et RONKAY, 1998) **comb. n.** (Fig. 2)

P. fusca (HREBLAY et RONKAY, 1998) **comb. n.** (Fig. 1)

P. minjakonka **sp. n.**

***Protognorisma minjakonka* sp. n.**

(Figs 3–4, 13–14, 27–28)

Holotype: Male, [China], "Li-kiang, ca. 4000 m, Prov. Nord-Yuennan, Li-kiang, 24.9.1935, H. Höne", slide No. VZ3220, deposited in coll. AKM Bonn.

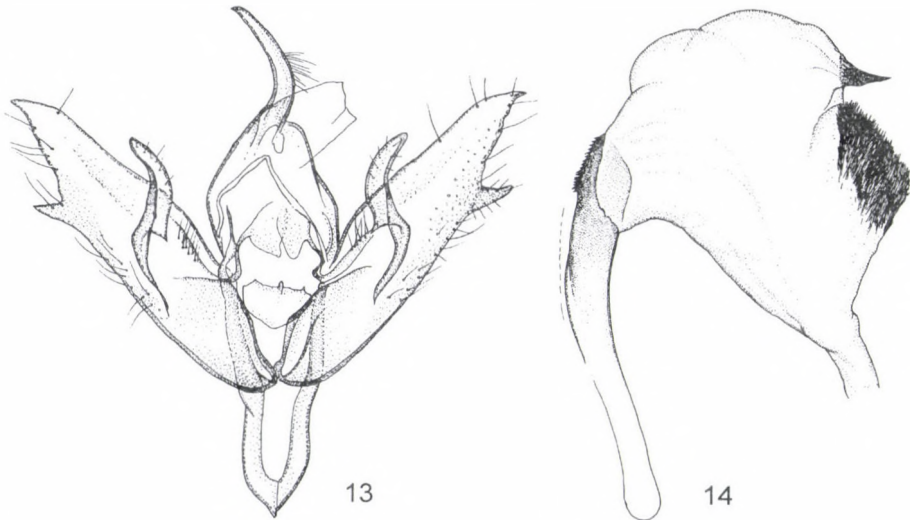
Paratypes: 1 male, 8 females, from the same locality, 27.VIII., 6.IX., 8.IX., 11.IX., 16.IX.1935; 1 female, from Li-kiang, ca. 2000 m, 19.IX.1935, coll. H. HÖNE (AKM Bonn, HNHN Budapest).

Slide Nos H6556 BOURSIN (male), VZ3221, RL6552 (females).

Diagnosis: *P. minjakonka* is similar externally to *P. fusca* and *P. lineolata*, differing from them by its paler, more pinkish forewing ground colour, more sharply defined crosslines and paler hindwing.

The distinctive features of the male genitalia of *P. minjakonka*, compared with *P. fusca* and *P. lineolata* are the longer aedeagus, the more elongate, distally much more tapering valva continuing directly in the acute apical lobe, the longer, stronger pollex-like extension, the shorter uncus and the thicker, less curved harpe. This valval shape mostly resembles that of *Eugnorisma trigonica* (ALPHÉRAKY, 1872) but the apical lobe is smaller, the "pollex" is stronger, more acute, lacking the blackish macrotricha and the harpe is much shorter, thicker than that of *E. trigonica*.

The female genitalia of *P. minjakonka* differ from those of *P. fusca* and *P. lineolata* by their much broader, proximally dilated, medially strongly folded



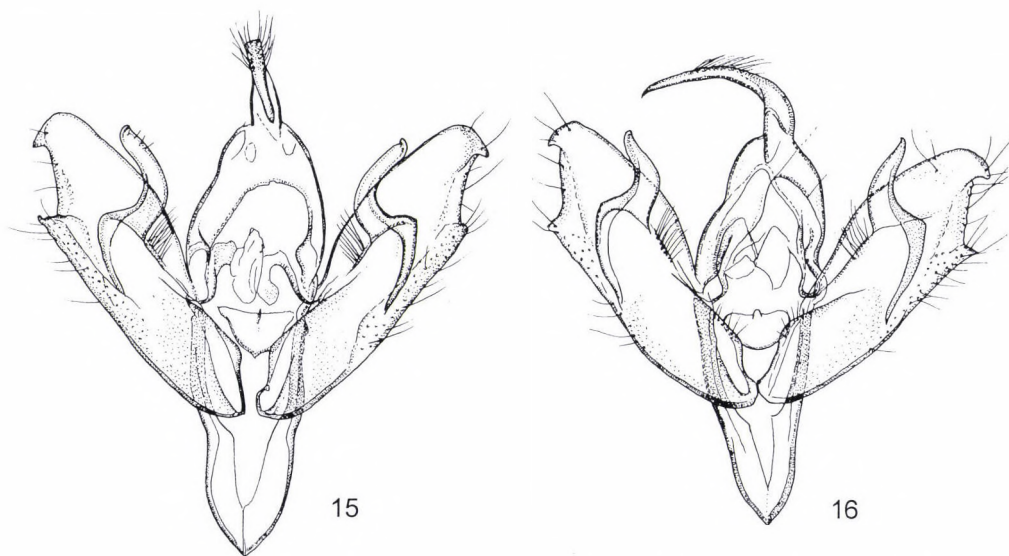
Figs 13–14. Male genitalia of *Protognorisma minjakonka* sp. n., holotype

ductus bursae, more elongate, elliptical-sacculiform corpus bursae with longer signa, stronger, broader ovipositor having longer gonapophyses, and with the larger, more distinct appendix bursae.

Description. Wingspan 29–34 mm, length of forewing 14–16 mm. Sexes similar. Head and thorax dark red-brown, antenna of male finely ciliate; abdomen somewhat paler, grey-brown, anal tuft orange-brown. Forewing elongate, narrow, apically pointed, outer margin slightly concave below apex. Ground colour light ochreous-brown with variably strong pinkish- or violaceous-brown suffusion. Ante- and postmedial crosslines simple, red-brownish, rather sharply defined, former oblique, almost straight, latter fine, slightly sinuous; median fascia broad, diffuse, greyish brown. Orbicular and reniform stigmata large, rounded, encircled with darker brown, reniform filled with darker grey-brown, claviform rather large, apically rounded. Subterminal line dark brown, wide, double, consisting of less sinuous, interrupted inner and more sinuous, continuous outer lines. Hindwing ochreous grey, suffused with brown, veins slightly darker; cilia ochreous, spotted with brown.

Male genitalia (Figs 13–14): Uncus rather strong, curved, tegumen narrow, fultura inferior narrow, weak, cup-shaped, vinculum long, strong, V-shaped. Valva elongate, distally tapering, with apex continuing directly in acute apical lobe, pollex-like ventral extension narrow, acute triangular. Saccus narrow, short, harpe thick, relatively short, slightly curved, with apex rounded. Aedeagus long, tubular, arcuate, carina with strongly dentate dorsal plate. Vesica spacious, recurved ventrolaterally, subbasal diverticulum broad, short, conical, armed with strong, acute, thorn-like cornutus, terminal spinulose field large, semiglobular.

Female genitalia (Figs 27–28): Ovipositor relatively short, broad, papillae anales short, wide, slightly pointed, apophyses rather long. Ostium bursae sclerotized, short, wide, pentagonal, ductus bursae medium-long, flattened, sclerotized, medially folded, proximally dilated. Appendix bursae broadly tubular with rounded apical part, membranous with long ribs, corpus bursae elongate-sacculiform, membranous with long wrinkles, and with four signa, three of them longer, ribbon-like, fourth short, rounded.



Figs 15–16. Male genitalia: 15 = *P. fusca* (HREBLAY et RONKAY), paratype; 16 = *P. lineolata* (HREBLAY et RONKAY), paratype

Taxonomic notes. The new species represents the most primitive known state within the genus, displaying ancient characters (some of which refer to the hypothetical common ancestor of the two main lineages of the *Eugnorisma* genus-group (s. str.), these are marked with asterisk):

- in the external appearance the *Xestia*-like wing shape and pattern is the most expressive in this species;
- in the male genitalia the valva and the aedeagus are more elongate (*);
- in the female genitalia the ductus bursae is stronger in sclerotization, with rather strong medial fold (*), the signa are the strongest, more or less ribbon-like.

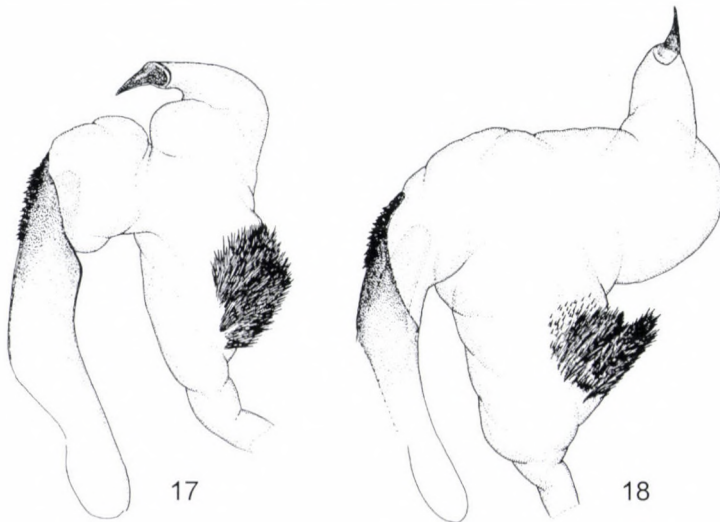
Bionomics and distribution. The new species is known from the eastern mountainous chains of the Tibetan plateau, the specimens were collected in the middle of autumn (end of August–end of September).

Etymology. The specific name is given after Minja Konka, the highest peak of the eastern bordering chains of the Tibetan plateau, in the Tahsueshan Mts, Sichuan (now Gongga Shan, 7590 m).

Anagnorisma gen. n.

Type species: *Eugnorisma goniophora* HACKER, RONKAY et VARGA, 1990, *Acta zool. hung.* 36(3–4): 332, pl. I.: 1, 2; figs 1, 2, 6, 7.

Diagnosis. The comparison of the genera *Eugnorisma* (s. str.), *Protognorisma*, *Anagnorisma* and *Schizognorisma* are given in detail in certain paragraphs of



Figs 17–18. Male genitalia: 17 = *P. fusca* (HREBLAY et RONKAY), paratype; 18 = *P. lineolata* (HREBLAY et RONKAY), paratype

the phylogenetic considerations of the genus-group and, especially, in the "Taxonomic notes" under *Protognorisma*. The main differences between the sister genera *Anagnorisma* and *Schizognorisma* are summarized below as follows: in the external appearance the species of *Anagnorisma* the darkened (dark brown or black(ish)) patches of the cell are regularly present, this area is not or only slightly darker in the species of *Schizognorisma*. In the male genitalia of *Anagnorisma* the strong dorsal plate of the carina may be present or partly or fully reduced, but without hooked ventro-lateral process; the subbasal cornutus is present, strong; the pollex-like saccular extension is situated more distally, its shape is broader triangular (or reduced to a small spine), not cuneate. In *Schizognorisma*, the dorsal plate of the carina is reduced but substituted by long, hooked-falcate ventro-lateral process; the cornutus is missing; the pollex-like saccular extension is situated much proximad, it is acute, wedge-shaped. In the female genitalia the ostium bursae of *Anagnorisma* is narrower, the ductus bursae is longer, sometimes folded, with long postero-lateral ostial lobes, the corpus bursae is narrower, weak ribbon-like signa may be present. In *Schizognorisma* the ostium is simple, broad but short, the ductus bursae is shorter, with strong, rounded postero-lateral lobes; the corpus bursae is larger, without signa.

Description. Wingspan 35–38 mm, length of forewing 17–18 mm. Sexes similar. Head rather small, eye large, globular. Second segment of labial palp distally broadened, forming a large apical tuft ventrally, third segment very small, smoothly scaled. Frons broad, smooth, frontal tuft large, protruding, vertex smooth, with smaller tuft. Antenna of male ciliate with short fasciculate cilia, that of female filiform, with sparse, fine cilia. Thorax rather strong, with more or less homogenous pubescence, collar large, often with dark apical stripe. Tegula less distinct, prothoracic tuft crest-like, metathoracic tuft large. Tibia of foreleg with a row of spines along inner margin and with additional spines near apex, those of mid- and hindlegs with two rows of 4–7 spines ventrally and ventro-laterally. Basal segments of tarsi with three rows on ventral side. Abdomen slender, long, cylindrical, dorsal crest reduced, anal tuft large. Forewing rather broad with apex pointed, outer margin evenly arcuate. Ground colour variable from pale slate- or ash-grey through dark red-brown to deep violet-brown. Ante- and postmedial crosslines less distinct, double, less sinuous, median fascia variably strong, usually diffuse, darkest marking of wing. Orbicular and reniform stigmata large, rounded or flattened, partly or fully encircled; other parts of cell with darker brown or blackish markings. Hindwing whitish or ochreous, with intense greyish brown suffusion, veins, discal lunule and marginal area usually darker.

Male genitalia (Figs 19–22): Uncus slender, medium-long or long, curved, tegumen narrow, low. Fultura inferior weak, cup-shaped, fine dorsal crest sometimes present. Vinculum medium-long, strong, V-shaped. Valva elongate, apically strongly tapering (*goniophora*) or costal and ventral margins almost parallel (*eucratides*, *zakaria*), with apex rounded, apical lobe variably strong, pointed. Pollex-like ventral extension short, weak (*goniophora*, *eucratides*) or large, acute triangular (*zakaria*). Sacculus broad, sclerotized, clavus large, rounded, finely setose. Harpe variably long, short, thick, pointed (*goniophora*), longer but thick, slightly curved, with apex rounded (*zakaria*) or rather long, slender, pointed (*eucratides*). Aedeagus short, cylindrical, dorsal plate of carina weak, smooth (*goniophora*), strong, with long crest having large medial tooth (*eucratides*) or aedeagus dilated at distal end, dorsal plate of carina reduced but ventral part with broad, shortly triangular plate (*zakaria*). Vesica tubular, curved laterad, medial part scobinate, subbasal diverticulum broadly tubular, armed with strong, acute, wide-based cornutus.

Female genitalia (Figs 33–35): Ovipositor short, rather weak, apophyses slender, fine. Ostium bursae sclerotized, broad, long, with deep, U-shaped caudal incision (*zakaria*, *glareomima*), or plate like, broad in *eucratides*, much narrower in *goniophora*. Posterior two-thirds of ductus bursae sclerotized, funnel-like, proximal third forming rounded, membranous-wrinkled bulb (*zakaria*, *glareomima*), distal part may be flattened, with almost parallel lateral margins and with fine marginal crests (*goniophora*) or proximally folded, and with strongly sclerotized medial part (*eucratides*). Appendix bursae relatively long, subconical, finely rugulose, corpus bursae medium-long, elliptical-ovoid, membranous (*zakaria*, *glareomima*) or large, spacious, elliptical (*eucratides*, *goniophora*). Signa absent (*zakaria*, *goniophora*) or present as rather long (*eucratides*) or shorter, interrupted (*glareomima*) stripes.

Bionomics and distribution. The genus has a rather restricted range extending from the north-western Himalayas to the south-western parts of the Karakoram, the eastern Hindukush and in Nuristan. The habitats of the species are often strongly different, including dry, warm mountainous grasslands, montane semi-deserts and subalpine meadows with rich herbaceous vegetation and with sparse, shrubby birch stands. The flight period of the taxa begins at the end of the summer (mid-August) or at the early autumn (September) and is finished in the late autumn (mid-October). The species are seemingly local and rare except *A. goniophora* which may appear in higher individual numbers around the artificial light. The early stages are unknown.

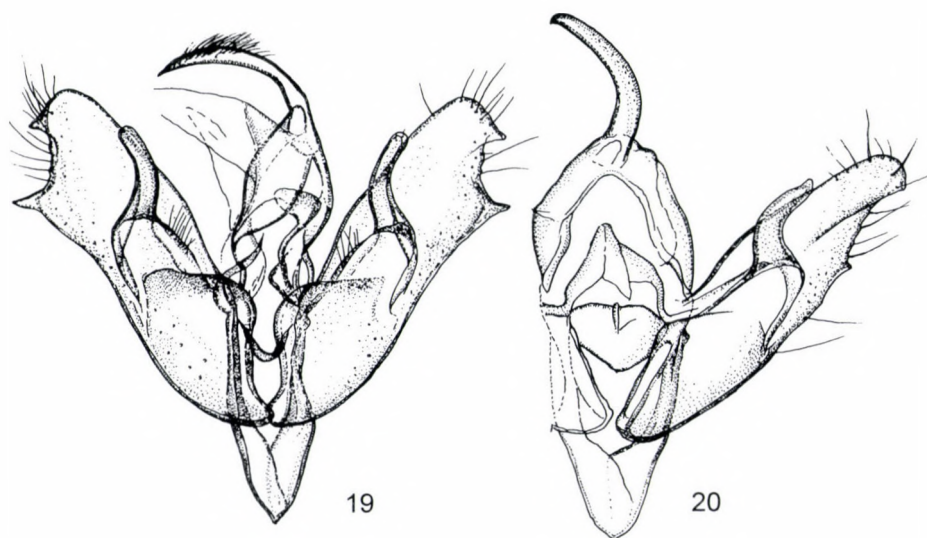
The species of the group:

A. eucratides (BOURSIN, 1957) **comb. n.**

A. goniophora (HACKER, RONKAY et VARGA, 1990) **comb. n.** (Fig. 11)

A. glareomima (VARGA et RONKAY, 1991) **comb. n.**

A. zakaria sp. n.



Figs 19–20. Male genitalia: 19 = *Anagnorisma zakaria* sp. n., paratype; 20 = *A. goniophora* (HACKER, RONKAY et VARGA), Pakistan

Anagnorisma zakaria sp. n.

(Figs 5–6, 19, 21, 33)

Holotype: Male, "PAKISTAN, Kashmir, Himalaya Mts, Deosai Plains, Kashmir, 3650 m, 75°12'E, 35°01'N, 16–18.08.1998, leg. Z. Varga et G. Ronkay", coll. G. RONKAY, Budapest (deposited in the HHM, Budapest).

Paratypes: 18 specimens of both sexes, with the same data as the holotype; 1 male, Deosai Plains, Bubin village, 3300 m, 21–22.IX.1998, leg. P. GYULAI and A. GARAY (coll. P. GYULAI, B. HERCZIG, G. RONKAY, Z. VARGA and HHM).

Slide Nos RL6414 (male), RL6439 (female).

Diagnosis: *A. zakaria* is an allopatric sibling species of *A. glareomima* although externally mostly resembles the members of the genus *Metagnorisma* VARGA et RONKAY, 1987 by its rather robust body, brownish ground colour of the forewing and by the rather diffuse dark markings of the cell. It differs externally from the related *Schizognorisma fuscisignata* (HAMPSON, 1903) by its shorter, broader, apically less acute forewing, the upper part of the outer margin is not concave. The crosslines are less sinuous, the orbicular and reniform stigmata are smaller, their filling is darker than in *S. fuscisignata* and the hindwing is brown, not whitish.

The most typical features of the male genitalia of *A. zakaria*, distinguishing the new species from the congeneric taxa are the significantly larger pollex-like lobe of the valva, the apically rounded, rather short, flattened harpe, the longer, more slender uncus and the sclerotization of the carina where the dorsal dentate plate is missing but the ventral part is dilated, having short, triangular, sclerotized plate.

The clasping apparatus is mostly similar to that of *Protognorisma fusca* but the vinculum is shorter, the valva longer with larger, more acute pollex-like extension and thicker, less curved, apically more rounded harpe, and the sacculus is much broader with larger lobe of clavus.

The female genitalia of *A. zakaria* are close only to those of *A. glareomima* by the configuration of the ostium and ductus bursae (see Fig. 33 and VARGA et RONKAY, 1991, Fig. 5) but the ostial part is generally broader with larger, more rounded postero-lateral lobes and with much broader, U-shaped medial incision, and the signa are missing. The female genitalia of the new species differ mostly from the other members of the genus by their considerably larger ostium bursae with much deeper, U-shaped caudal incision, longer, more funnel-like, proximally more tapering ductus bursae with rounded, membranous-wrinkled proximal bulb and by the shorter, elliptical-ovoid corpus bursae, having no signa.

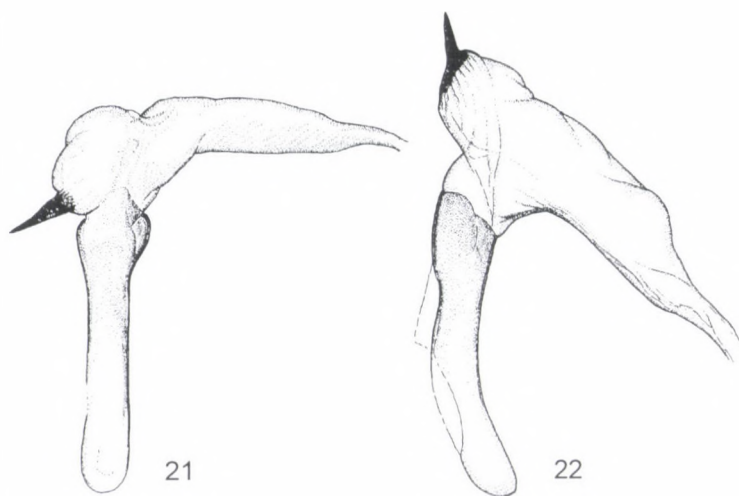
Description. Wingspan 36–38 mm, length of forewing 17–18 mm. Sexes similar. Head and thorax dark red-brown, sides of palpi blackish brown, antenna of male finely ciliate, collar with fine ochreous apical line. Abdomen paler, ochreous-greyish, mixed with brownish hair-scales, anal tuft orange-brownish. Forewing rather broad with apex pointed, outer margin evenly arcuate. Ground

colour dark red-brown with fine bronze-ochreous shine, most parts of wing irrorate with ochreous and dark grey-brown scales; veins with fine greyish cover at outer part of wing. Ante- and postmedial crosslines less distinct, double, less sinuous, dark brown filled with ochreous; median fascia strong, broad, diffuse, dark brownish grey, darkest marking of wing. Orbicular and reniform stigmata large, rounded, fully encircled with fine ochreous annuli, orbicular filled with pale red-brownish and a few greyish scales, reniform with dark grey-brown ones. Other parts of cell covered with darker brown scales; claviform missing or very pale, ochreous arch. Subterminal interrupted, diffuse ochreous line, defined with broad, dark brownish fascia at inner side. Terminal line fine, dark brown, cilia as ground colour. Hindwing ochreous with intense greyish brown suffusion; veins, fine discal lunule and marginal area darker. Terminal line dark brown, cilia orange-greyish. Underside of wings whitish, inner area of forewing dark grey-brown, costal parts of both wings irrorate with pinkish brown scales, transverse lines and discal spots fine, darker grey.

Male genitalia (Figs 19, 21): Uncus slender, curved, tegumen narrow, low, fultura inferior narrow, weak, cup-shaped, vinculum medium-long, strong, V-shaped. Valva elongate, costal and ventral margins almost parallel, apex rounded, apical lobe rather small, pointed, pollex-like ventral extension large, acutely triangular. Saccus broad, sclerotized, clavus large, rounded, finely setose. Harpe thick, slightly curved, with apex rounded. Aedeagus short, tubular, dilated at distal end, ventral part of carina with broad but short, triangular plate. Vesica tubular, curved laterad, medial part scobinate, subbasal diverticulum broadly tubular, armed with strong, acute, wide-based cornutus.

Female genitalia (Fig. 33): Ovipositor short, rather weak, apophyses slender, fine, ostium bursae sclerotized, broad, long, with deep, U-shaped caudal incision, posterior two-thirds of ductus bursae sclerotized, funnel-like, proximal third forming rounded, membranous-wrinkled bulb. Appendix bursae rather long, subconical, finely rugulose, corpus bursae short, elliptical-ovoid, membranous; signa absent.

Bionomics and distribution. The new species is known only from the type locality, lying at the border zone of the Deosai National Park (Pakistan, Kashmir, Nanga Parbat area). The habitat is a subalpine meadow with rich herbaceous vegetation, the surrounding slopes with sparse, shrubby birch stands. The specimens of the type series are in rather good condition, therefore the main flight period is the first half of August, no examples were observed at the same site a month earlier.



Figs 21–22. Male genitalia: 21 = *Anagnorisma zakaria* sp. n., paratype; 22 = *A. goniophora* (HACKER, RONKAY et VARGA), Pakistan

Etymology. The new species is dedicated to Dr VAQAR ZAKARIA, director of the Himalayan Wildlife Project, coordinator of the zoological research in the Deosai National Park (Pakistan, Kashmir).

Schizognorisma gen. n.

Type species: *Richia fuscisignata* HAMPSON, 1903, *Cat. Lep. Phal.* IV: 597, pl. 76, fig. 15.

Diagnosis. The comparison of the *Eugnorisma* (s. l.) generic group is given in detail in numerous paragraphs of the phylogenetic considerations of the genus-group and, especially, in the 'Taxonomic notes' under *Protognorisma*. The main differences between the sister genera *Anagnorisma* and *Schizognorisma* are summarized in the diagnosis of *Anagnorisma*, therefore only the main diagnostic characters of *Schizognorisma* are repeated here. Externally, the inner parts of the forewing cell are not or only slightly darkened and the hindwing may white or whitish. In the male genitalia, the carina has no strong dorsal plate but has a long, hooked-falcate ventro-lateral process, the subbasal cornutus is missing and the pollex-like saccular extension is acute, wedge-shaped, situated close to the middle of the ventral margin of the valva. In the female genitalia, *Schizognorisma* has simple, broad but short ostium bursae, trapezoidal ductus bursae with strong, rounded postero-lateral lobes and the corpus bursae has no signa.

Description. Wingspan 38–42 mm, length of forewing 18–21 mm. Sexes similar. Head rather small, eye large, globular. Second segment of labial palp distally broadened, forming large apical tuft ventrally, third segment either small, smoothly scaled (*fuscisignata*) or longer, with well-developed ventral tuft (*rhodostola*). Frons broad, smooth, frontal tuft large, protruding, vertex smooth, with smaller tuft. Antenna of male with short fasciculate cilia, that of female filiform, with sparse, fine cilia. Thorax rather strong, with rather homogenous pubescence, collar large, often with dark apical stripe. Tegulae less distinct, prothoracic tuft crest-like, metathoracic tuft large. Foretibia with row of strong spines at inner margin and with additional spines near apex, mid- and hindtibiae with two rows of 4–8 long spines ventrally and ventro-laterally. Tarsi regularly with three rows of spines on basal segment ventrally, occasionally additional spine may appear laterally. Abdomen slender, long, cylindrical, dorsal crest reduced, anal tuft large.

Forewing elongate with apex pointed, outer margin evenly arcuate. Ground colour pale orange-brownish with ochreous irroration (*fuscisignata*) or shiny rosy-brown with fine violaceous hue (*rhodostola*), median area irrorate with dark greyish brown scales. Wing pattern less conspicuous, ante- and postmedial crosslines slightly sinuous, partly double, median fascia strong, broad, diffuse. Orbicular and reniform stigmata large, rounded, incompletely encircled, outer part of reniform darkened. Medial part of cell with darker patch between stigmata; claviform missing or represented by dark grey-brown shadow. Hindwing rounded, more or less unicolorous, milky whitish (*fuscisignata*) or dark greyish brown (*rhodostola*).

Male genitalia (Figs 23–26): Uncus slender, curved, tegumen narrow, medium-high, fultura inferior weak, more or less rhomboidal with fine medio-apical crest, vinculum strong, V-shaped. Valva elongate, distally tapering, costal margin straight (*rhodostola*) or more convex (*fuscisignata*). Cucullus narrow with rounded apex and rather large, triangular ventral lobe. Sacculus broad, sclerotized, clavus rounded, less developed, saccular extension ("pollex") acute, cuneate. Harpe thick, rather short, curved or falcate, with apex rounded. Aedeagus short, thick, carina with sclerotized,

long, falcate-hooked, apically slightly serrate ventro-lateral process. Vesica broadly tubular, curved laterad, medial part inflated, scobinate, without diverticula, cornutus or spinulose field.

Female genitalia (Figs 36, 37): Ovipositor short, weak, apophyses short, fine. Ostium bursae with sclerotized, broad but short ventral plate. Ductus bursae sclerotized, proximally tapering, either medium-long, trapezoidal with straight lateral margins (*rhodostola*) or longer, more funnel-like (*fuscisignata*); postero-lateral edges with stronger, rounded lobes. Appendix bursae large, rounded subconical, finely wrinkled, corpus bursae long, spacious, saccate, weakly membranous, without signa.

Bionomics and distribution. The distribution of the genus seems to be restricted to a smaller area of the historical Kashmir (recently India: Jammu and Kashmir) and to the Kaghan area (Pakistan), the two known species appear as allopatric. The genus comprises autumnal species, the imagines are on the wing in September–October. The imagines are attracted to artificial light.

The species of the genus

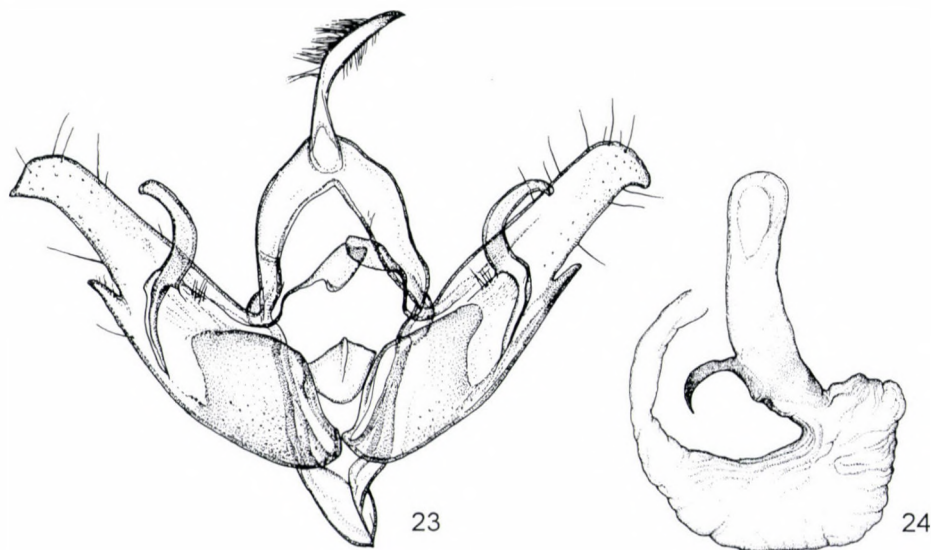
S. fuscisignata (HAMPSON, 1903) **comb. n.** (Fig. 12)

S. rhodostola sp. n.

***Schizognorisma rhodostola* sp. n.**

(Figs 7–10, 23–24, 36)

Holotype: Male, "PAKISTAN, Himalaya Mts, Kaghan valley, Tathabaya, 2200 m, 73°26'E, 34°36'N, 9–10. IX.1997, leg. Gy. Fábán & G. Ronkay", slide No. RL6413, coll. G. RONKAY (deposited in the HNBM Budapest).



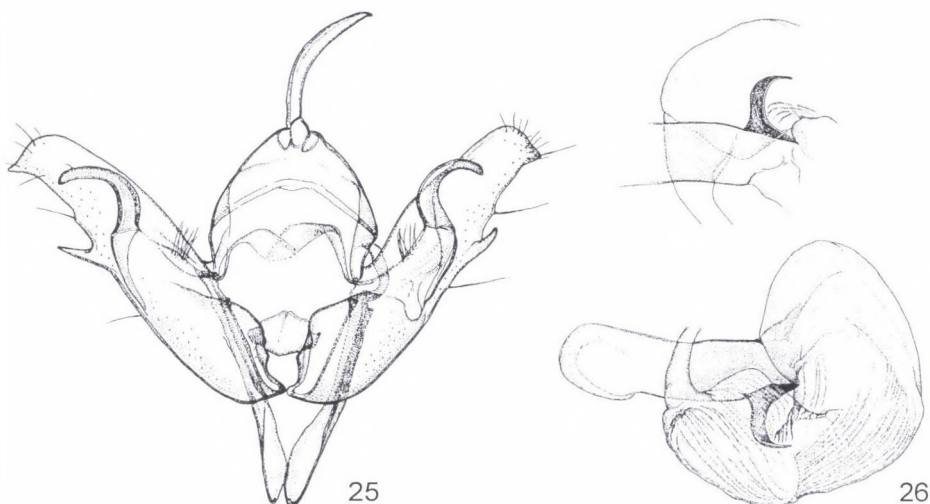
Figs 23–24. Male genitalia of *Schizognorisma rhodostola* sp. n., holotype

Paratypes: 3 females, Pakistan, Himalaya Mts, Kaghan valley, 7 km S of Kaghan, Khanian village, 2500 m, 21.X.1998, leg. Gy. M. LÁSZLÓ & G. RONKAY; 1 male, 1 female from the vicinity of Khanian, 1770 m, 12–13.IX.1998, leg. P. GYULAI and A. GARAY (coll. P. GYULAI, G. RONKAY and HNHM).

Slide No RL6440 (female).

Diagnosis. The new species differs from its close relative, *S. fuscisignata*, by its broader, apically less pointed forewing with dark rosaceous brown ground colour, less distinct, more sinuous crosslines, larger, less darkened stigmata but with darker patch between them and the dark greyish brown hindwing. *S. fuscisignata* has narrower, apically more pointed, pale reddish-brown forewing with sharper, more straight crosslines, narrower stigmata with darker filling of reniform and pale whitish-ochreous hindwing of both sexes. The underside of wings is also different in the two species, that of *S. rhodostola* being greyish white with stronger dark brown irroration (especially on the forewing) while the underside of both wings is pale milky ochreous in *S. fuscisignata*.

Most members of the genus *Anagrorisma*, *A. eucratides*, *A. goniophora* and *A. glareomima* have pale reddish grey or dark violaceous grey-brown forewing with more sharply defined, less sinuous crosslines and the cell with conspicuous black patch between orbicular and reniform stigmata, while *A. zakaria* has shorter, broader, red-brown forewing with ochreous irroration and the hindwing is also darker greyish brown.

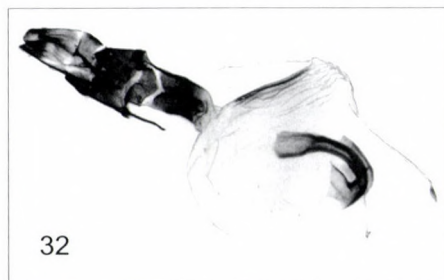
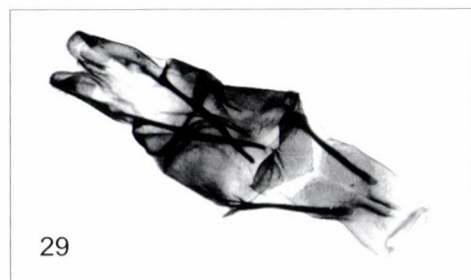
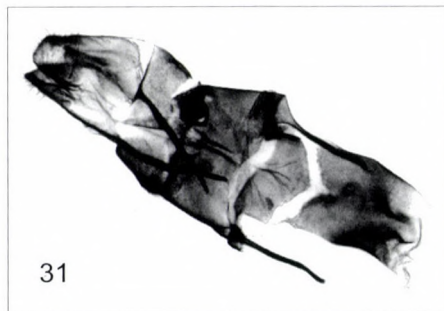
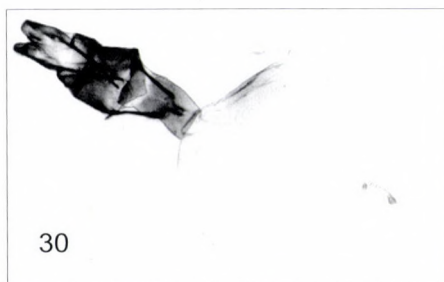
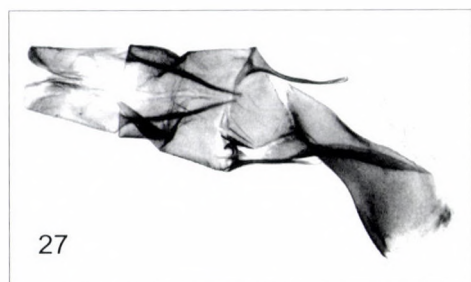


Figs 25–26. Male genitalia of *S. fuscisignata* (HAMPSON), Kashmir

The male genitalia of *S. rhodostola* differ from those of *S. fuscisignata* by their much narrower distal part of valva with more rounded cucullus, stronger, thicker, more straight saccular extension ("pollex"), longer, less curved harpe, finer hook of the carina and by the smaller, less spacious vesica.

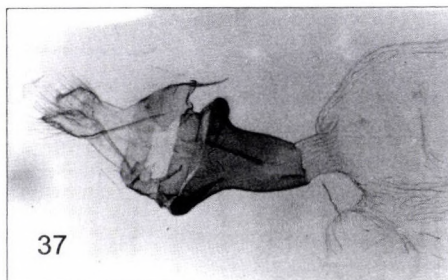
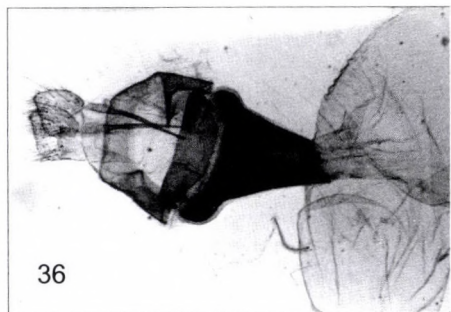
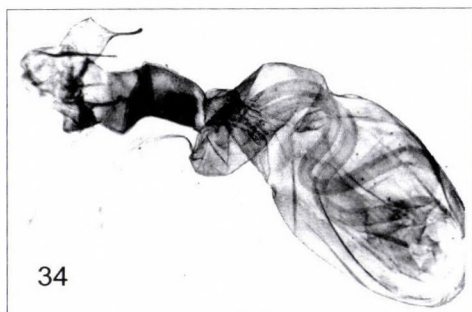
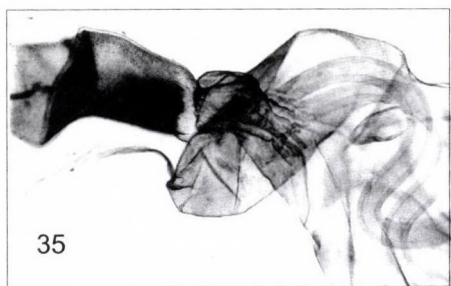
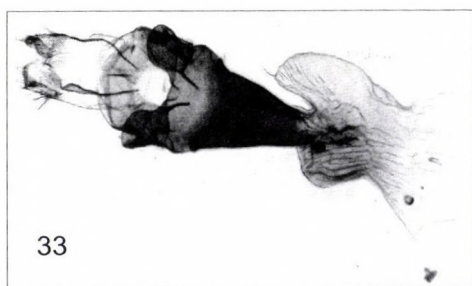
In the female genitalia, *S. rhodostola* has shorter but broader, more trapezoidal ductus bursae with straight lateral margins and larger, stronger postero-lateral folded lobes while the ductus bursae of *S. fuscisignata* is longer, narrower, with arcuate lateral margins and smaller postero-lateral lobes.

Description. Wingspan 39–41 mm, length of forewing 18–19 mm. Sexes similar. Head and thorax dark rosaceous brown mixed with ochreous hairs, sides of palpi blackish brown, antenna of male finely ciliate. Abdomen more greyish, anal tuft orange-ochreous. Forewing elongate with apex pointed, outer margin evenly arcuate. Ground colour shiny rosy-brown with fine violaceous



Figs 27–32. Female genitalia: 27–28 = *Protognorisma minjakonka* sp. n., paratype; 29–30 = *P. lineolata* (HREBLAY et RONKAY), paratype; 31–32 = *P. fusca* (HREBLAY et RONKAY), paratype

hue, median area irrorate with dark greyish brown scales; veins with fine greyish covering at outer third of wing. Ante- and postmedial crosslines less distinct, less sinuous, partly double, antemedial with sharper outer line, postmedial with stronger inner line, both crosslines brown-grey, defined with pale rosy-grey. Median fascia strong, broad, diffuse, dark brownish grey, darkest marking of wing. Orbicular and reniform stigmata large, rounded, incompletely encircled with fine grey lines and a few whitish scales, outer part of reniform filled with darker greyish scales. Medial part of cell with darker brown patch between stigmata; claviform missing or represented by dark grey-brown shadow. Subterminal line interrupted, whitish, sinuous, defined with dark brownish fascia at inner side. Terminal line fine, dark grey-brown, cilia as ground colour. Hindwing more or less unicolorous dark greyish brown, discal spot poorly visible. Terminal line dark brown, cilia orange-greyish. Underside of wings patternless, whitish grey, inner area of forewing dark grey-brown, other parts of wings irrorate with brownish scales, traces of transverse lines and hindwing discal spot usually present.



Figs 33–37. Female genitalia: 33 = *Anagrorisma zakaria* sp. n., paratype; 34–35 = *A. eucratides* (BOURSIN), Afghanistan; 36 = *Schizognorisma rhodostola* sp. n., paratype; 37 = *S. fuscisignata* (HAMPSON), Kashmir

Male genitalia (Figs 23–24): uncus slender, curved, tegumen narrow, medium-high, fultura inferior weak, more or less rhomboidal with fine medio-apical crest, vinculum strong, V-shaped. Valva elongate, distally tapering, cucullus narrow with rounded apex and rather large, triangular ventral lobe. Saccus broad, sclerotized, clavus rounded, less developed, saccular extension (“pollex”) acute, cuneate. Harpe thick, rather short, curved, with apex rounded. Aedeagus short, thick, carina with sclerotized, long, falcate-hooked, apically slightly serrate ventro-lateral process. Vesica broadly tubular, curved laterad, medial part inflated, scobinate, without diverticulum, cornutus or spinulose field.

Female genitalia (Fig. 36): Ovipositor short, weak, apophyses short, fine. Ostium bursae with sclerotized, broad but short ventral plate, ductus bursae sclerotized, trapezoidal, proximally tapering with straight lateral margins and large, strong, folded postero-lateral lobes. Appendix bursae large, roundly subconical, finely wrinkled, corpus bursae long, spacious, saccate, weakly membranous, without signa.

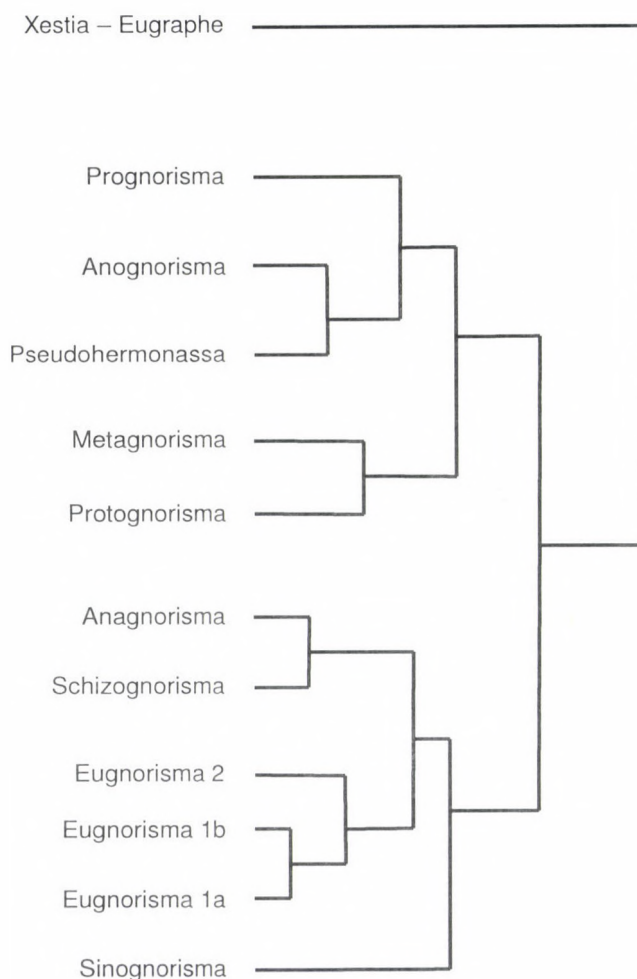


Fig. 38. A tentative cladogram of the “eugnorismoid” genera

Bionomics and distribution. A late autumnal species, the rather worn females collected in October were found together with the typical members of the winter fauna (e.g. *Himalistra* and *Meganephria* species). The habitats are steep rocky slopes with open Himalayan conifer woodlands and rocky grasslands at 2200–2500 m a.s.l. The imagines are attracted to artificial light.

The distribution pattern of the twin species is probably allopatric, as *S. fuscisignata* was found in the more eastern (Indian) part of the historical Kashmir while *S. rhodostola* is known only from the Kaghan area.

Etymology. The specific name refers to the fine rosaceous hue of the forewing.

*

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ORIBATID MITES FROM SWITZERLAND, IV (ACARI: ORIBATIDA: SUCTOBELBIDAE)*

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H-1088 Budapest, Hungary, E-mail: mahunka@zoo.zoo.nhmus.hu

Diagnoses are given and relationships discussed for two new oribatid mite genera (*Helvetobelba* gen. n. and *Unicobelba* gen. n.) from Switzerland. Two new species, *Helvetobelba dichotoma* and *Unicobelba ypsilon signata* are described and one new combination, *Unicobelba truncicola* (Forsslund, 1941) is suggested.

Key words: Acari, Oribatida, Suctobelbidae, taxonomy, new taxa, new combination, Switzerland

INTRODUCTION

Our studies on the taxonomy, faunistics and zoogeography of the oribatid fauna of Switzerland started decades ago. The present and a following paper (MAHUNKA & MAHUNKA-PAPP 2000) deal with the members of the family Suctobelbidae. Herein we give the description of two new species which also represent new genus. A third paper (MAHUNKA & MAHUNKA-PAPP 2000) will list 27 species of Suctobelbidae from Switzerland. At the same time we review the state of the supraspecific taxa of the family in the Palaearctic. All morphological notes and the applied nomenclature referring to the family will be discussed therein.

DESCRIPTION OF THE NEW TAXA

***Helvetobelba* gen. n.**

Diagnosis: Family Suctobelbidae JACOT, 1938. Rostral region rather simple, median rostral apex roundish, with sharply pointed lateral teeth. Behind them the lateral margin slightly concave, incisions absent. Rostral setae evenly curved mediad, not geniculate. Tectopedial field clearly developed. One pair of lamellar knobs bearing the lamellar setae. Dorsosejugal margin of the notogaster without apophyses, notogastral surface smooth. Ten pairs of long, simple noto-

* Acarologica Genavensia XCVI, the new title for this series is "Neue und interessante Milben aus dem Genfer Museum I–LX." and "New and interesting mites from Geneva Museum LXI–LXXX."

gastral setae present. Epimeral setal formula: 3–1–3–3. Anogenital setal formula: 6–1–2–3. Setae *ad*₁ in postanal, lyrifissures *iad* in paraanal position. Posterior margin of epimeral borders IV serrate, with tubercles or waved. Other features (gnathosoma, legs) as in type genus of the family.

Type species: *Helvetobelba dichotoma* sp. n.

Remarks: The new genus is related to *Suctobelba* Paoli, 1908 (STRENZKE 1951), however, the rostrum of the only known species lacks the rostral incisure. The completely divided lamellar knob, the number of genital setae and the position of the adanal setae are dissimilar to *Suctobelba* species.

Etymology: Named after its place of origin.

***Helvetobelba dichotoma* sp. n.**

(Figs 1–4)

Material examined – Holotype: “TI-11: Tessin: Rancate, forêt de châtaigniers, tamisages; 7.IX.1965; leg. C. Besuchet.” Two paratypes from the same sample, 2 paratypes: “SG-4: St. Gallen: Quinten, feuilles mortes; 17. VIII. 1999; leg. C. Besuchet.” Holotype and 1 paratype in the Muséum d’Histoire naturelle, Genève (MHNG), 2 paratypes (1640–PO–99) deposited in the Hungarian Natural History Museum (HNHM), Budapest, with identification number of the specimens in the Collection of Arachnida.

Measurements – Length of body: 236–260 µm, maximum width of body: 134–142 µm.

Prodorsum: Rostrum very wide, rostral setae arising medially, curved inwards, ciliate. Lateral teeth long. Margin concave behind the rostral teeth a triangular plate present under the margin (Fig. 4, marked with an arrow). Shape of tectopedial fields normal. Between them a well divided lamellar knob present, both tubercles bearing lamellar setae. A pair of weakly sclerotised costulae present in the interbothridial region. Bothridia large, also well sclerotised, with a relatively small, roundish basal apophysis. Behind each bothridium a separate, large tubercle present. Sensillus long (Fig. 1), its distal part asymmetrically incrassate, with some minute cilia.

Notogaster: Dorsosejugal margin distinct medially. Ten pairs of mostly straight notogastral setae present. All setae finely roughened.

Lateral part of podosoma (Fig. 3): Exobothridial and acetabular region well sclerotised and granulated. Exobothridial tubercles form a characteristic, longitudinal lath. Pedotecta I small, with some alveoli and a transverse line.

Ventral parts: Median part of the mental tectum well protruding anteriorly (Fig. 2). Epimeral borders and apodemes normally developed, a wide sternal field present between the epimeral plates medially. Epimeres IV normal in shape, with serrated posterior border. Setae *1c* located laterally, on the surface of pedotecta I. Setae *4c* arising on basal part of discidium. Anogenital setal formula: 6–1–2–3. Anterior pairs of genital setae longer than the others. Position of adanal setae normal, setae *ad*₁ in postanal position. All setae in this region mostly smooth.

Legs: Form and chaetotaxy of legs I and IV as for the family. Setae *p* of tarsi II–IV spiniform. Two ventral setae of tarsus IV plumose.

Remarks: The new species is well distinguishable from all members of the *Suctobelba*, *Suctobelbella*-group by its divided lamellar knob.

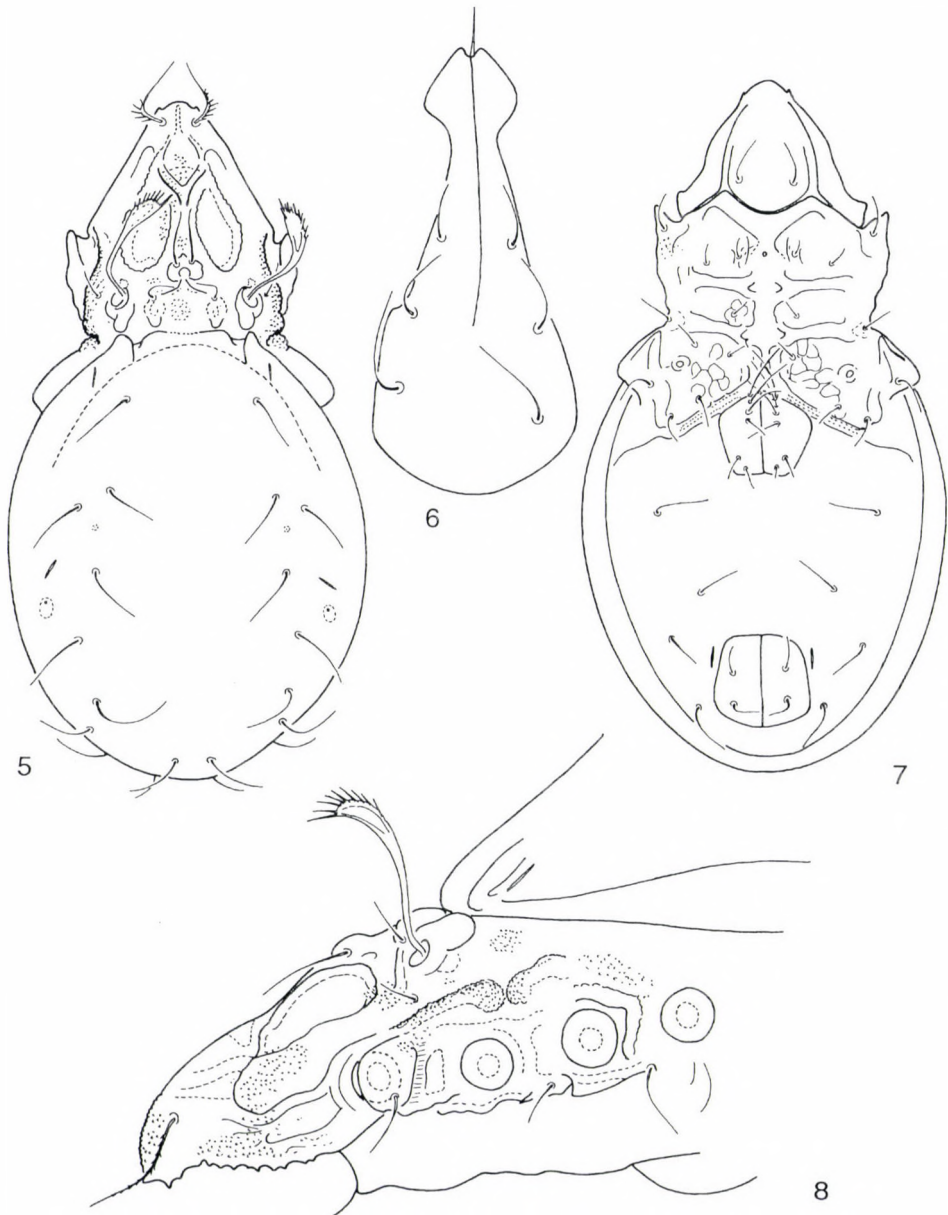
Etymology: Named after the divided interlamellar knob.



Figs 1–4. *Helvetobelba dichotoma* gen. et sp. n. 1 = body in dorsal view, 2 = body in ventral view, 3 = prodorsum in lateral view, 4 = prodorsum in dorsal view. Legs not illustrated

Measurements – Length of body: 256–278 μm , maximum width of body: 134–143 μm .

Prodorsum: Rostrum rounded, in dorsal view one pair of small lateral teeth visible. Nearly whole surface of prodorsum granulate, larger tubercles or pustules absent. Rostral setae bent inwards, not geniculate, basally well ciliate. Prodorsal margin serrate, among the small teeth no signi-



Figs 5–8. *Unicobelba ypsilon signata* gen. n. et sp. n. 5 = body in dorsal view, 6 = mentum, 7 = body in ventral view (part), 8 = podosoma in lateral view. Legs not illustrated

ficant difference exists (Fig. 5). In front of tectopedial field a Y-shaped costula present, between them a well developed, wide lamellar knob present, bearing the conspicuously long lamellar setae. Interbothridial field* well developed, from them a pair of ridges directed to the lamellar knob. Bothridia large, well sclerotised, with basal lobes. Sensillus with long peduncle (Fig. 8) and wide, asymmetrically incrassate head, with some long cilia.

Notogaster: Dorsosejugal margin indistinct medially. Lateral condyles large, well separated. Median part without condyles. Ten pairs of simply curved notogastral setae present.

Lateral part of podosoma (Fig. 8): Exobothridial and acetabular region well sclerotised and granulated above the acetabular region. Exobothridial tubercles form a characteristic, longitudinal ridge.

Ventral parts: Epimeral borders and apodeme normally developed, a wide sternal field present between the epimeral plates medially. Sternal apodeme partly observable also in this region. Epimeres IV with a ring-shaped well sclerotised ridge. Epimeral border IV undulate, along them a channel of varying depth having pustulate inner surface running parallel with the posterior epimeral border (Fig. 7). Epimeral setae simple, setae *Ic* located laterally, on the surface of pedotecta I. Anogenital setal formula: 6-1-2-3. Anterior pairs of genital setae longer than the others. Position of adanal setae normal, setae *ad*₁ in paraanal position. All setae in this region mostly smooth. Lyrifissures *iad* located also in paraanal position.

Legs: Form and chaetotaxy of legs I and IV typical for the family. Setae *p* of tarsi II-IV simple, setiform. Two ventral setae of tarsus IV dilated, distinctly spinose.

Remarks: The new species is very similar to *Unicobelba truncicola* (FORSSLUND, 1941), however, is much smaller (354-391 µm in *truncicola*), has no large tubercles between the tectopedial fields (present in *truncicola*) and has Y-shaped ribs in front of tectopedial fields, which are absent in *truncicola* (see FORSSLUND 1941).

Etymology: Named after its characteristic prodorsal formation.

*

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* A pair of fields bordered by arcuate, often dentate ribs between the bothridia.

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The oribatid species described by Berlese (Acari)

MAHUNKA, S. and L. MAHUNKA-PAPP

The authors had the opportunity for years to study the Oribatid species described by Berlese currently deposited in the Istituto Sperimentale per la Zoologia Agraria at Florence. The results of this series of studies are summarized in this volume.

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